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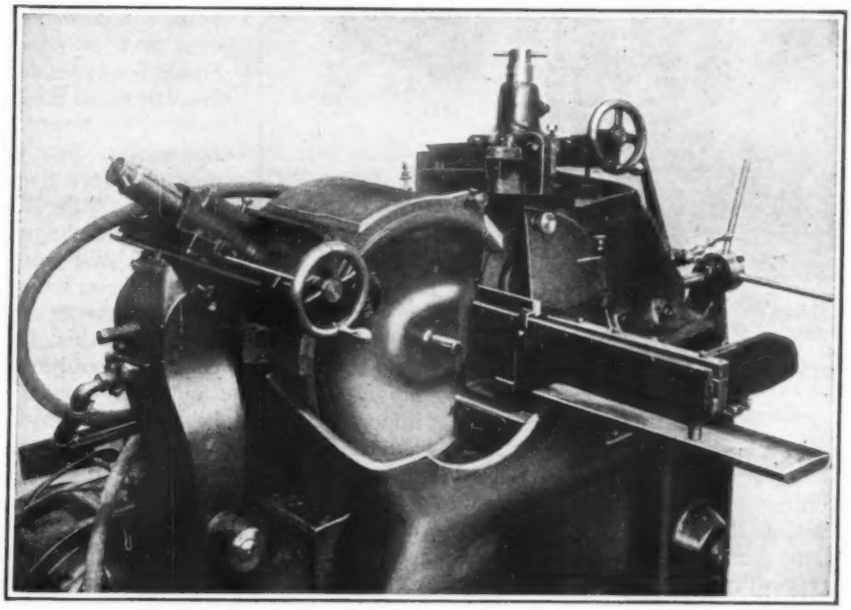


Centerless grinder set up to grind carbon electrodes 1 in. in diameter at a feed rate of 50 ft. per minute

Centerless Grinding of Non-Metallic Parts

ALTHOUGH the centerless grinder is a comparatively new machine tool, it has been adopted by manufacturers so rapidly that its possibilities and principles of operation are already fairly well understood by most engineers and mechanics. This machine has greatly increased the production and improved the accuracy of the regular grinding jobs, and has made possible the development of a relatively new field of grinding on work never before thought practical.

In the past, cylindrical grinding generally has been conceded to be a costly method of finishing work, and resorted to only when the nature of the work was such that it could not be finished otherwise. The introduction of the centerless grinder, however, has completely upset this condition. The designing engineers and production men are making special efforts to have their work applicable to the centerless grinder, and so pronounced is its advantage in the production of metal parts that they have already begun to look into the possibilities of finishing non-metallic parts by this same method.

A list of the non-metallic material already being ground by the centerless machine includes the following: Fiber, carbon, glass, wood, rubber, bakelite, celluloid, zylonite, pyrolene, kyloid, casein, pearl—and other button materials, spark plug cores, rawhide and porcelain.

One of the most important products of the carbon industry is the carbon electrode, as found in the common dry cell electric battery, in the electric arc lamp, and in arc welders. These electrodes are shaped by the extrusion process, in sticks about 36 in. long, and are baked at a high temperature for many days, from which it can readily be seen that the manufacturer has no opportunity to control the size or roundness of the rods.

The centerless grinder is used to round up and accurately size the carbons, which are generally cut to the length of the finished part before they come to the grinder. It is possible to do this on the centerless by the straight-through method in one pass, removing from 0.003 in. to 0.020 in. stock on the diameter within a limit of plus or minus 0.001 in. at a rate of between 20 and 100 ft. per min., depending upon the diameter of the electrode. This refers to the range of sizes between

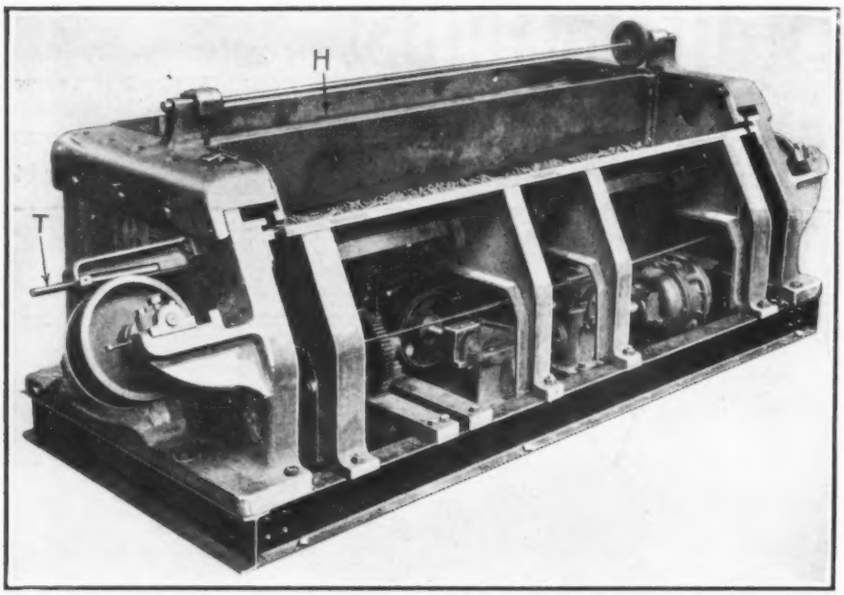


Fig. 1—A hopper capable of feeding $\frac{3}{16}$-in. carbons $2\frac{1}{4}$ in. long to a centerless grinder at a rate of 200 ft. per minute

$\frac{3}{16}$ in. and $1\frac{1}{4}$ in. in diameter, and includes most carbons made in large quantities. The production methods and requirements are generally different for the larger electrodes, which may run as high as 24 in. in diameter, such as are used on large electric furnaces in the steel mills.

The machine shown in the headpiece is set up to grind carbons 1 in. in diameter, at the rate of 50 ft. per min. The wheel used is a hard carbide of silicate, 36 grain, "K" hardness. This type of wheel, which has a sharp brittle grain and a tough vitrified bond, is good for most non-metallic grinding. The wheel is 20 in. in diameter and 8 in. wide.

A cam arrangement is provided to true the face of the wheel to a contour rather than a straight cylindrical form. This is necessary in order to distribute the load on the grinding wheel so that about half of the wheel is used for removing the stock, and the remainder of the width of the wheel for accurate sizing and producing smooth finish. The rapid rate at which work of this nature can be ground makes it desirable to have a power driven feeder for the machine. Fig. 1 shows the hopper for feeding small carbon electrodes, such as are used in the ordinary radio "B" battery cell, and also the flashlight battery cell. These are approximately $\frac{5}{16}$ in. in diameter by $2\frac{1}{4}$ in. long.

The centerless grinder has a capacity to finish grind these parts at the rate of one million in twenty-four hours, or approximately 15 pieces per second. The hopper shown has a capacity to feed these pieces into the machine at even a faster rate than this.

The electrodes are dumped in bulk into the large reservoir marked *H*. A reciprocating slide arrangement agitates the parts in a way that causes them to drop into a long slot, at the bottom of which is a belt running at about 200 ft. per min. in the same direction that the slot is cut. A tube arrangement at the end of the slot picks the parts off of the belt, and this tube (marked *T*) connects up directly with the work rest on the centerless grinder. The friction due to the weight of the parts on the belt is sufficient to force the parts all the way through the tube to the machine, but does not affect the normal feeding rate set on the grinder.

Some of these carbon grinders are connected up so that the pieces, as they are cut to length on the cut-off machine, drop immediately into the hopper which feeds the grinder. Connected directly to the "leaving" side of the grinder, is a special tube arrangement which inspects the work for length and ejects all pieces that are $\frac{1}{32}$ in. long or short. On leaving the gaging tube, they enter a continuous dryer, from which they go into a packing machine and are stacked in bundles of one thousand each. This combination of automatic machinery makes a very neat and compact high production lineup for these small parts. The first installation of the centerless grinder on these small carbons paid for itself in a few weeks. It might be interesting to note the fact that the shop superintendent and the foreman *knew* that it was absolutely impractical to grind these carbons because of the expense, basing their judgment, of course, on past experience with grinders. And, on top of this, the chemist was sure that grinding the carbons would ruin them, because, as he explained, the outside "glazed" surface was very important in the chemical action of the battery. But, as a matter of fact, under careful laboratory tests of several thousand batteries, half of them being made with unground carbons, and half with ground carbons, the ground carbons showed a much more uniform, and a greater total output than the unground carbons. The advantage gained by this alone was sufficient justification for grinding the electrodes, although the main reason for grinding them was to obtain accurate size at the ends of electrodes so that a copper cap could be pressed on to a perfect fit, since loose fits, and the resulting poor electrical contact, are a source of noise in the average radio set.

In Fig. 2 is shown a centerless equipped to form the points of welding arc carbons. The carbons come to the grinder in cylindrical form, and it is necessary to reduce the diameter to form a long tapering point. A carbon of this kind that is 1 in. in diameter and is to be tapered down to $\frac{1}{8}$ in. in a length of 6 in. can be ground by this method at a rate of twelve pieces per minute.

There is provided on the grinder a means for dressing the wheels to form any desired taper in the throat between the wheels. The work rest is a quick acting tilting mem-

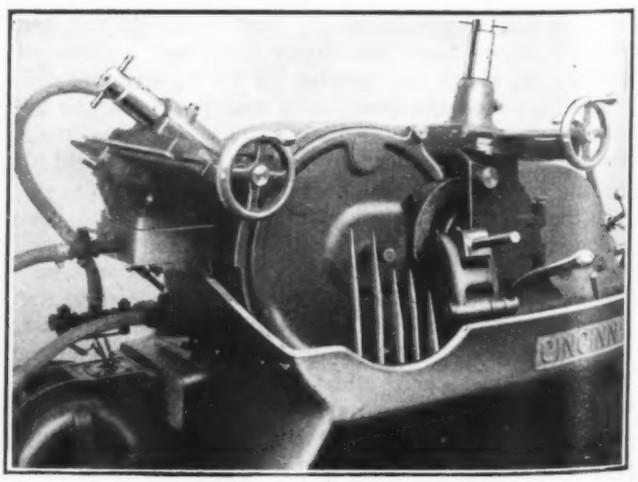


Fig. 2—Equipment needed to point carbon electrodes for welding machines. Production is 12 pieces per minute

ber arranged to swing the work up into the throat from beneath and between the wheels. The surplus stock on the carbon is removed by the grinder as the work is forced into the tapered throat formed by the wheels, which are, of course, as wide as the length of the tapered portion of the work. This method of swinging the work into the wheels is such that no particular part of the grinding surface of the wheel has to remove all of the stock. In other words, the grinding load on the wheel is properly distributed over its full width of cutting face.

The stock removal on all of these carbon grinding machines is so great that it is necessary to have a large and fresh source of water supply and a quick scheme for draining the residue from the grinder. In some cases the water nozzle is connected direct to the hydrant and the drain pipe of the machine is connected to the sewer.

The centerless grinder is already used extensively in the rubber industry for finishing vulcanized rubber tubes and rods. These are made in various diameters, from $\frac{1}{16}$ in. to 3 in., all with an average length between 3 ft. and 5 ft. The method of molding and curing these tubes and rods is such that it is impossible to control the diameter, and since these tubes and rods are to be made into smaller parts through the use of automatic machinery, it is necessary to have them come to the screw machine, or other automatic machinery, with a more nearly uniform size than the ordinary process will make them.

The average tube or rod is passed through the grinder at a rate of 25 to 50 per minute, and one pass is sufficient to produce accurate enough sizing for the subsequent operations on automatic machinery. However, such tubes and rods, in both short and long lengths, are often finished to a very accurate size and with a high polish, by grinding, in which case it is necessary to make a second pass. The finishing pass is taken with the same setup and at approximately the same rate as the roughing pass, but with a stock removal not exceeding 0.015 inch.

The grinder shown in Fig. 3 is set up for this class of work. Tubular guides leading up to the work rest, and away from the work rest, are necessary, and the clearance between the guides and the rod, or tube, that is to be ground, should be at least $\frac{1}{8}$ in. This forms a loose-fitting guide which does not interfere with the very fast rotation of the work as it is being ground. It is an easy matter to change the setup from one size tube or rod to another. Micrometer adjustments are necessary to provide arrangements for easy and accurate sizing.

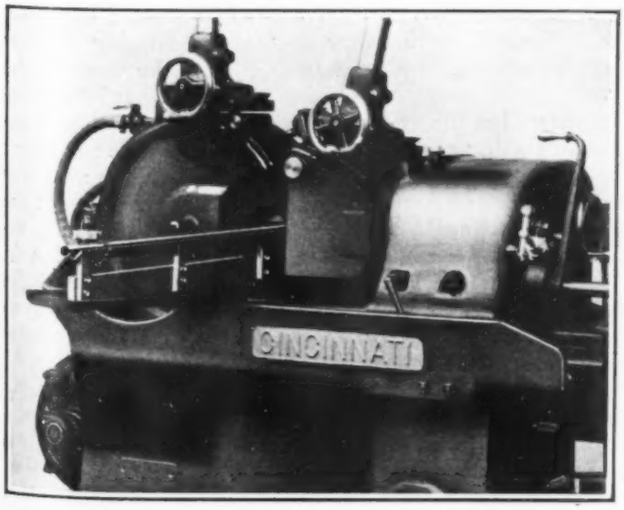


Fig. 3—The type of centerless grinder used for grinding rods and tubes of hard rubber and similar materials

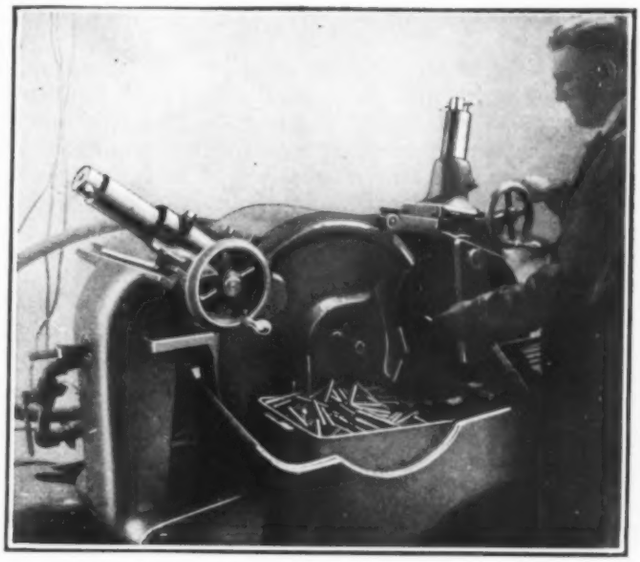


Fig. 4—Casein fountain pen barrels are ground by the infeed method

A grinder set up for forming fountain pen barrels is shown in Fig. 4. The outside contour of this barrel is formed complete in one roughing cut, and one finishing cut, each cut taken at the rate of approximately 20 pieces per min. The required form is generated on the grinding wheel by means of a cam. The work is dropped by hand, or automatically, onto a work rest between the wheels. A lever, or automatic movement, is made to close the wheels in to a definite size, at the conclusion of which the work is ejected into a chute and a new piece immediately takes its place. The photograph shows a hand operated machine, but it is possible to do the same operation with the full automatic cycle when the manufacturing quantities are sufficiently large to justify it.

The operation, as shown, is carried out without regard to the concentricity of the outside diameter and the hole. It is possible, however, to do the same operation, working with a long mandrel, which will insure concentricity, but will slow up the operation materially. It may be interesting to know that concentric control on the centerless is not necessary if the work entering the grinder is concentric before the grinding operation. In other words, this method of finishing the outside diameter is such that a uniform stock removal takes place.

There is a wide range of materials made for uses similar to those of hard rubber, most of them being made by the extrusion process and being known under the various trade names, such as "Celluloid," "Zylonite," "Casein," "Pyralin," and many others.

Most of these products are made in rods and tubes, and the centerless grinder is used for preparing the stock so that it can be handled in automatic machinery, which in turn finishes it up into a wide variety of parts. It quite often happens that even the final finish and shape on some of the parts is worked out to the best advantage on the centerless grinder.

Most of this material is made into beads of imitation ivory, amber, etc. Many of these are finished on the centerless grinder, using a formed wheel to generate the desired shape on the beads. Much of the material used in the construction of frames for eyeglasses is finished on the centerless grinder. In fact, any part made of these various materials which is to be finished in a round

cross-section can be worked to advantage on the centerless grinder.

Many instruments require accurate glass tubes and glass rods which must be carefully fitted with the connection, or holding details, and must be ground in order to produce correct size. It would be very difficult to grind this material in the usual way, that is, using the center type of grinder, because of the brittleness of the material being ground. Since one of the fundamental principles of the centerless grinder is that of supporting the work directly opposite, and immediately under, the point of grinding, we have practically no bending strain on the work being ground and consequently almost no tendency to break the glass tube or the rod when ground in the centerless.

One of the most outstanding examples of the grinding action explained above is found in the grinding of $\frac{5}{32}$-in. glass tubing, 48 in. long, and having a $\frac{3}{64}$-in. hole. It is hard to conceive of any other way of grinding this brittle piece of glass and holding it accurately to size without breaking.

Pyrex glass has been found to be a very good insulator for high frequency currents, and, therefore, is used in radio condensers. The requirements are that the rod be ground in lengths of about 18 or 20 in. to an extremely smooth surface and held accurately to size so that the rod may be closely fitted into the mating parts. The high finish is necessary to prevent, as much as possible, the accumulation of dirt on the surface of the rod, thereby reducing the surface leakage of the electrical currents.

Practically all of the glass tubes and rods are ground by the through-feed method, using a carbide of silicon wheel, of rather coarse grain, for the rough grinding operation and the same type of abrasive, about 80 grain, and slightly soft, for the finishing operation.

The infeed method also is used in grinding glass, such as tapered bottle stoppers and pistons for glass syringes. The taper in the bottle stopper is obtained by truing the entire included angle on the regulating wheel, or by truing half the angle on each wheel. The rough stopper is placed in position on the work blade against an end

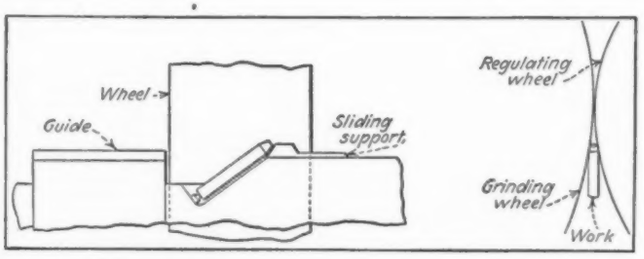


Fig. 5—Diagram of the fixture used for taper grinding the ends of gage glasses for an automobile gasoline gage

stop and the wheels are brought together by means of the infeed lever. On the return stroke of the lever the finished piece is ejected. The same general operation is performed in the case of the pistons for glass syringes, except that the periphery of the wheels is straight.

One of the most popular types of visible gasoline gages for automobiles depends upon the height of a red fluid in a small glass tube to indicate the quantity of gasoline in the tank. This glass has a tapered surface ground on the end in order that it may fit securely and be sealed against leakage of the fluid in the instrument. A novel method was developed for grinding this tapered surface direct from the cylindrical glass tubing on a centerless

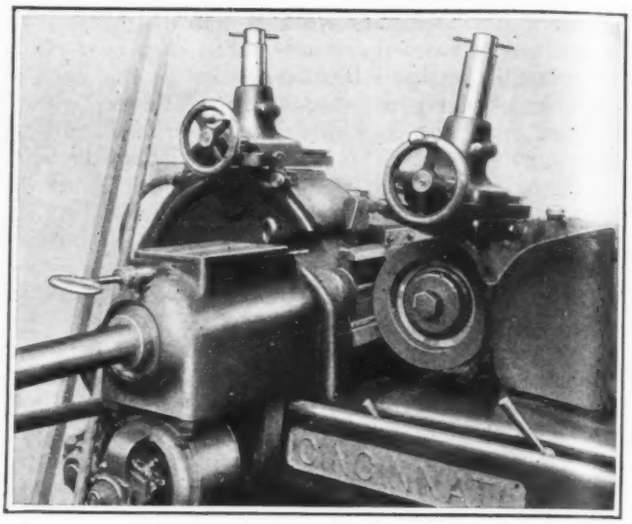


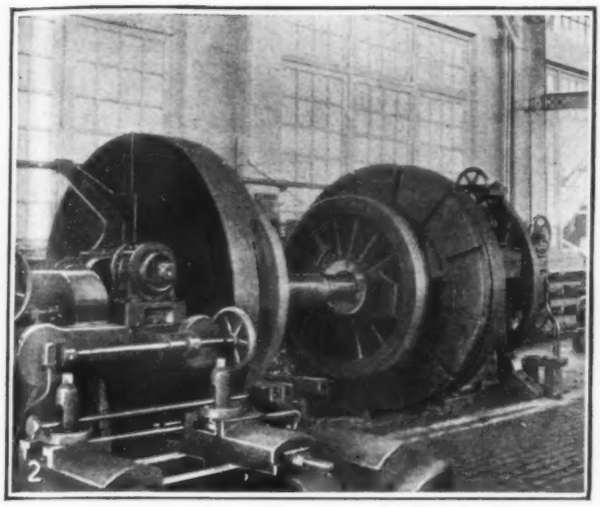
Fig. 6—Square fiber rods must be rotated mechanically for the roughing cut. This is the attachment used

grinder. Since the grinding wheel is 20 in. in diameter, and the length of the tapered portion very short, the curved surface generated by the wheel will closely approximate a straight line. The tube was held in a sliding support, Fig. 5, mounted below the center line of the wheels and placed on an angle in order to obtain the best possible support for the work. After a tube is placed in position, the support is slid through the wheels, thereby grinding the tapered end. One of the most important features of this method is that the whole width of the wheel is used instead of only a small portion.

Fiber has many uses and is fabricated into a countless number of articles having great variations in size and shape. Few of us realize through what processes this material goes before reaching its final shape.

Fiber tubing is made by rolling paper on a mandrel. This paper is chemically treated and baked, and the finished product must then be ground for certain requirements in order that the tube be round and to the correct size. The operation is a very simple one on the centerless grinder, and almost any length of tube can be ground which is convenient to handle.

Fiber rod is made in much the same way, except that the tubes are larger and are split lengthwise and pressed into flat slabs. These slabs are then sawed into square rods and here is where the centerless grinder has aided the fiber making industry the most. Turning of fiber has always been rather difficult in that the wear of the tool was excessive and it was, therefore, hard to maintain size, but the grinding wheel with its countless number of cutting edges is able to grind the square rod round in one or two passes through the machine. An auxiliary power-operated fixture is necessary in order to assist the regulating wheel in rotating the square rod. This attachment, with the rod in place, is shown in operation in Fig. 6. An overhead guide is necessary to control the rod and both wheels are shaped so that they are open to the front and thereby distribute the grinding action across the first part of the wheel. Fiber rod, up to $\frac{1}{2}$ in. in diameter can be ground without the use of the rotating fixture at a rate up to 40 ft. per minute, and held to a limit of 0.001 in. On work $\frac{1}{2}$ in. to 1 in. in diameter, the auxiliary fixture is used, and the production rate is 5 ft. to 20 ft. per minute. A carbide of silicon wheel, with thin crude oil as a lubricant, is used extensively on this work.



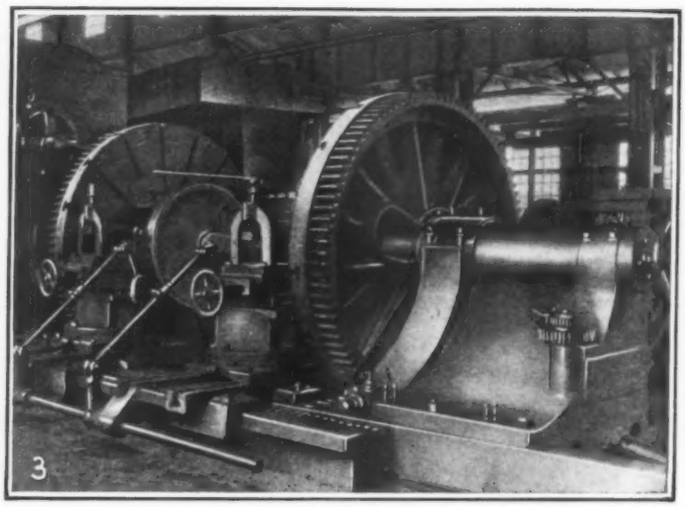


Fig. 2—Turning blind drivers in a wheel lathe. Fig. 3—Another wheel lathe turning truck wheels

Locomotive Maintenance Work at Camaguey, Cuba

By FRED H. COLVIN
Editor, American Machinist

ONE of the large divisions of the railway system that serves the sugar mills and other industries in the island of Cuba, is known as the Cuba railway and has its main shops at Garido, just outside of Camaguey, east of the center of the island. The shops are comparatively new, being but six years old, and are of steel construction with concrete walls and have wooden-block flooring. The machine tool equipment compares favorably with many railroad shops in the States, and cleanliness is very evidently one of the tenets of the management. These shops handle about 20 locomotives at once, and there are 36 tracks in the roundhouse. The chief mechanical engineer, A. Cooper, is a very progressive railroad official and attends all the A.R.A. conventions in Atlantic City. It is his policy to buy all the parts and supplies possible, such as driving boxes, flue sheets, etc. However, the shops have a small iron foundry in which are cast brake-block hangers and such small, odd parts as can best be made at the scene of operation. There is an oil-burning brass furnace and other up-to-date equipment. One ingenious device is a mirror conveniently located on a post just outside the boiler room of the power plant, and so tilted that the fireman can watch the top of his smokestack so as to have visible evidence at all times of the effect of his firing. A little idea of the construction of the machine shop and of the erecting shop, which is at one end of the machine shop, can be had in Fig. 1. This view shows the height of the erecting bay, the large proportion

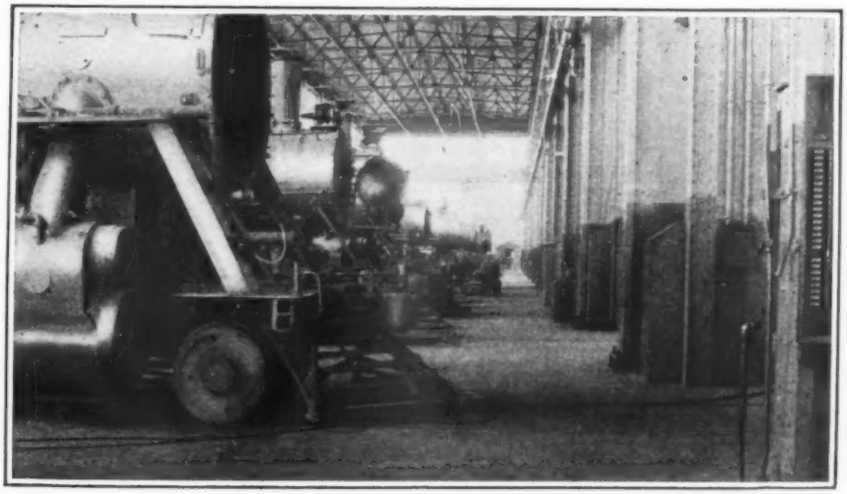


Fig. 1—Locomotives in the erecting shop. This shop is at the end of the machine shop. The view shows the large amount of glass in the end. It also gives a good idea of the general appearance of the shop

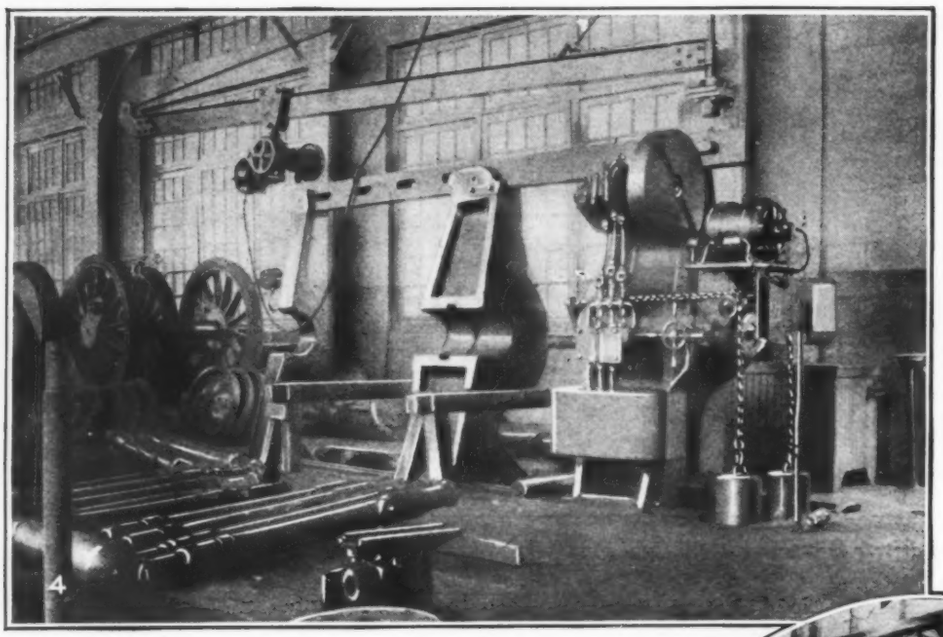


Fig. 4—A wheel press and its jib crane. A typical Southwark, railroad-shop wheel press with its self-contained hydraulic pump and inclined housing. The jib crane is equipped with an air-driven power hoist that makes it easy to handle pairs of driving wheels in and out of the press

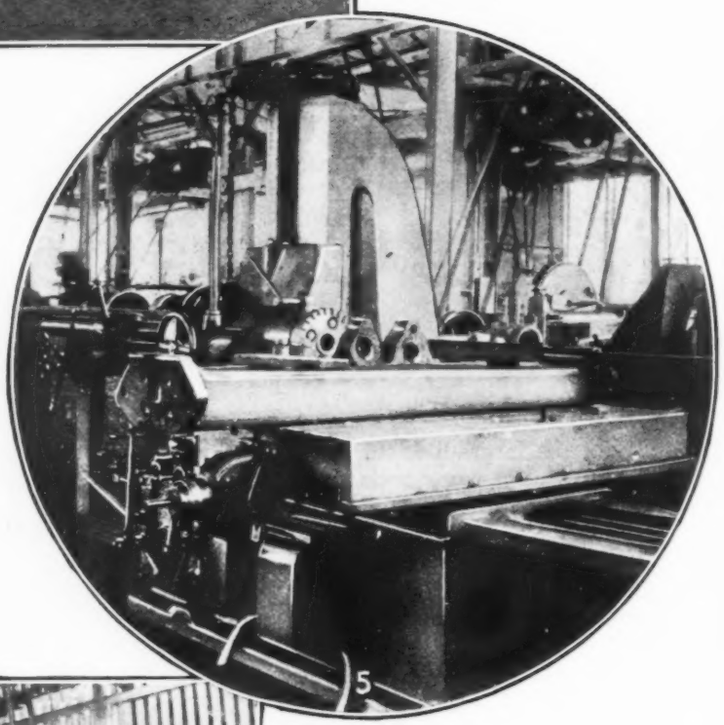


Fig. 5—Machining a valve-motion link hanger. This job is one of the many handled on the machine shown. The operations are boring the holes for the link hanger and facing the ends of the bearings, also the ends of the hanger frame where they fit on the side of the locomotive itself

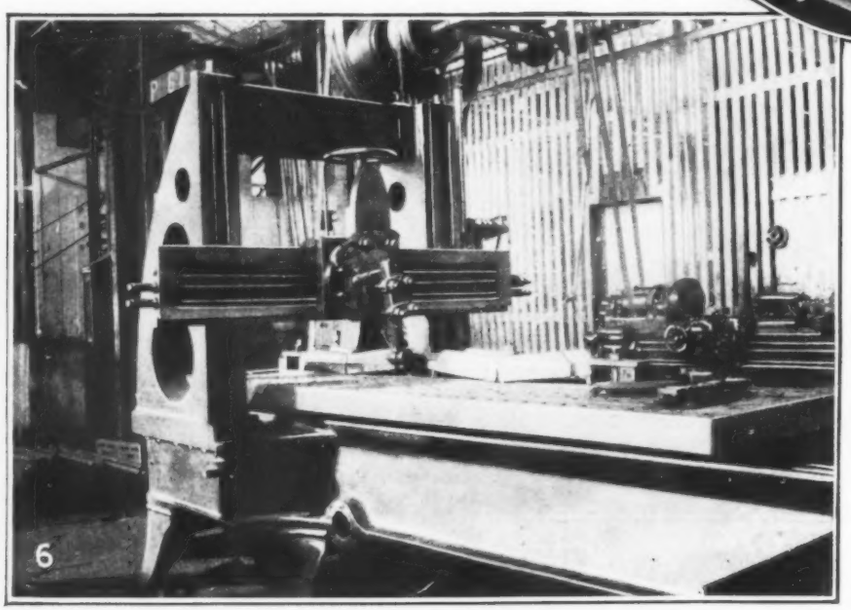


Fig. 6—Planing driving box wedges. This view shows that the almost universal method of obtaining the desired taper on the wedges for driving boxes is not confined to any nationality or location. The wedges are blocked up at the outer ends in the usual manner and are held by straps while the outsides are being planed

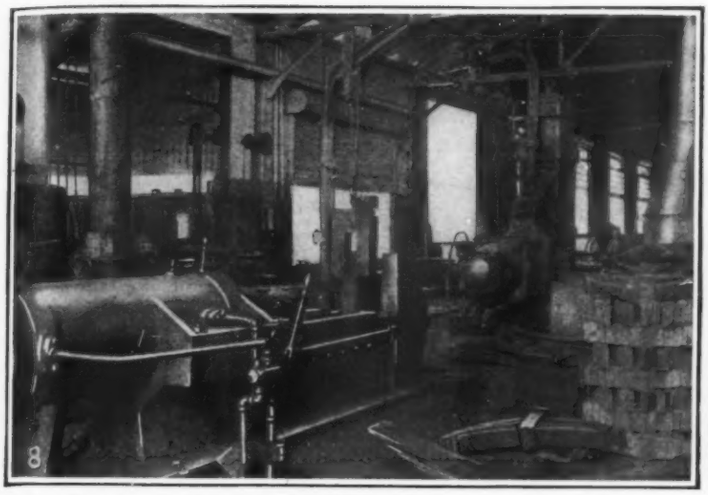


Fig. 8—The spring making department. This view gives a good idea of the compact arrangement of the various machines used in bending the spring leaves to the proper curvature; in holding them for banding; and for removing the bands when repairs are to be made.

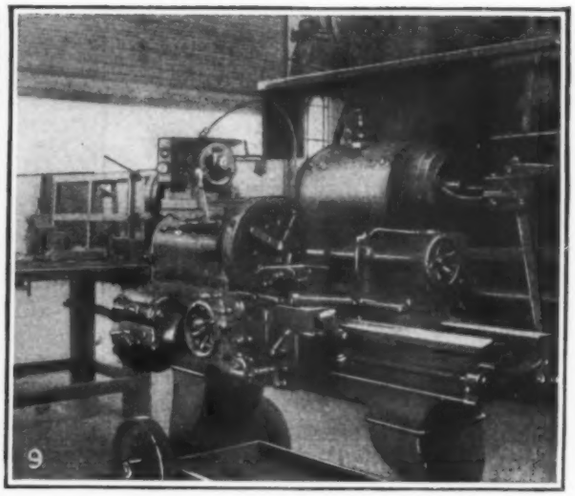


Fig. 9—Portable lathe for fitting frame bolts. This lathe is one of the two LeBlond machines in use for this work. It is motor driven and suitable outlets are provided between the various tracks in the erecting shop, so that an electric connection can be plugged at any convenient point

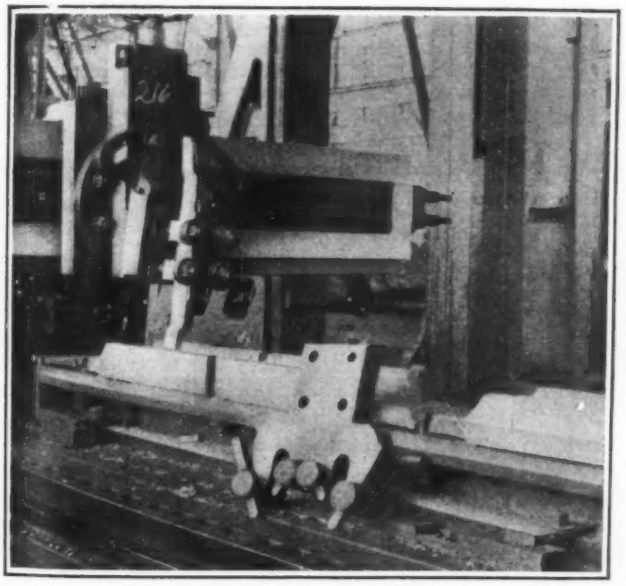


Fig. 7—Multiple tool for planing driving box shoes used in planing the inside and outside of the straight shoes

of glass in the end and the general appearance of both the shop and the locomotives. One of the older wheel lathes is shown in Fig. 2, with a pair of blind driving wheels in place. Something of the shop construction can be seen in the picture. This machine-shop bay is served by a traveling crane of sufficient capacity. The Niles wheel lathe to be seen in Fig. 3, is generally used for turning the tires of truck wheels, it is also used for driving wheels when the work warrants it. Both of the wheel lathes are driven by individual motors. Near the wheel lathes is the wheel press shown in Fig. 4. It is served by its own jib crane and is equipped with a small air motor for driving the hoisting drum. Piston heads and similar work are turned on Bullard, Niles and other vertical boring mills. These machines are grouped conveniently so as to reduce material handling as much as possible. Adjoining the vertical boring mills is a Lucas horizontal boring machine, Fig. 5, set up for milling a link housing.

Wedges are planed by the common method of tilting to the proper angle, as in Fig. 6. The machine used is an old Miles planer built by Frederick B. Miles, before he became connected with Bement, Miles & Co. It is still doing good work on light cuts. The method of planing shoes is shown in Fig. 7, by the use of a special toolhead attached directly to the clapper block after the tool holding straps have been removed. This toolhead carries four tools and planes down the inside and outside at the same time. The bottoms of the shoes are planed later.

Between the locomotives in the erecting shop are two LeBlond portable, heavy-duty lathes for turning frame bolts and the like, right on the job. One of the lathes is shown in Fig. 8. Tney are motor driven.

Just outside the machine shop is the spring making and setting department. It has a complete equipment of machines needed for this work. A modern spring bending machine is at the extreme left, by which springs can

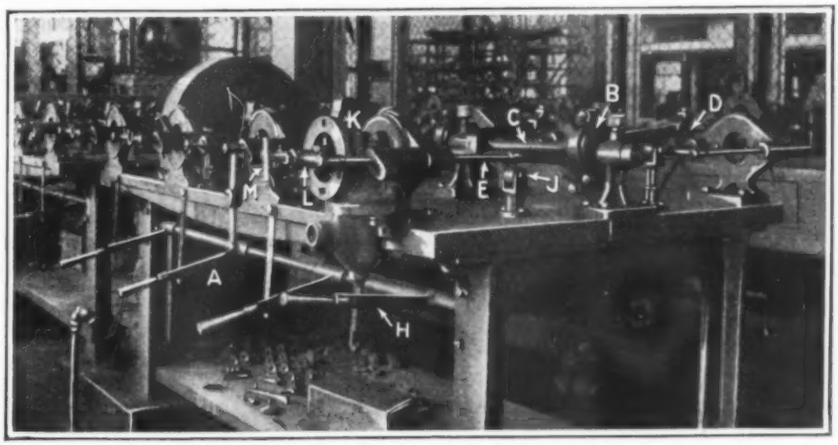


Fig. 10—Special machine for grinding brake valves of different types. It handles sixteen valves at once when necessary, allowing independent control of the grinding of any particular valve

be bent to any desired contour. Then there are banding presses and presses for removing the bands, making a very complete little plant that can handle any work needed here very nicely. In Fig. 9 all of these machines can be seen.

In the toolroom is a very ingenious machine, Fig. 10, designed by Agustin Aguero, general foreman, and built under his direction. It is really two machines, each designed for grinding certain kinds of air brake valve-mechanisms. A central shaft, driven by chain from a small electric motor at *A*, carries a suitable number of eccentrics, as at *B*, which impart reciprocating motion to the connecting rods *C*. It runs at from 150 to 180 r.p.m. The outer ends of the connecting rods have openings or hooks *D* that can be dropped over a bar, connecting the two side bars *E*. Bars *E* run in guides at each side of the frame that holds the air-brake valve, and move the head carrying the inner valve back and forth in the valve body.

The operation of the device for any particular grinding head is controlled by the levers beneath, as at *H*. The levers operate the rollers *J*, which lift the connecting rods *C* out of connection with the bars *E* and so stop their motion. The connecting rods ride back and forth on rollers *J*, and can be dropped into connection as soon as the work has been replaced, or the valve examined.

A brake valve is shown in place at *K*. The yoke *L* can be swung down out of the way so that a new valve can readily be put in place. The valve to be ground-in is attached to the yoke by means of the cross-handled screw *M*. The whole machine has been very carefully designed and built, and reflects great credit on both the ability and the interest of those in charge of this work. It has been in operation for something over a year and is proving very satisfactory. It has been patented by Mr. Aguero.

The connecting-rod and motion department is shown in Fig. 11. The rods are fitted on the horses to be seen at the left, which have a shelf underneath for holding the brasses, tools, etc., while the work is going on. After the rods have been completed, they are stored in the substantial steel rack shown in the background. The main rods are placed on the projecting ends of the cross members, which hold the two rods needed by one locomotive. The side rods are stored on top and motion rods and smaller parts, that can be more easily handled, go inside the rack, resting on the cross members. The links and other parts are placed near the rack, so as to be convenient in re-assembling the locomotive. This view also gives a good idea of the construction of the shop, shows the crane runway, and also identifies the railroad by the name on the tank in the distance.

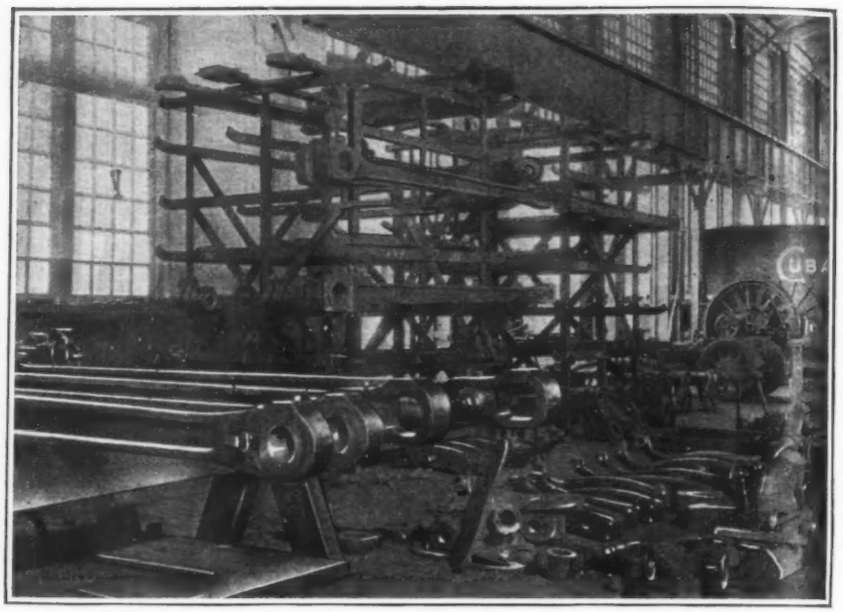


Fig. 11—Fitting and storing connecting rods. This view shows a corner of the connecting-rod fitting department, and includes the steel racks on which completed rods are stored awaiting replacement on the locomotives. The large, main rods are carried on the projections at the sides of the rack, while the short or intermediate rods are stored as seems best, either lengthwise or crosswise

The Trend of Scientific Control

IN a paper "Imagine Production Without Engineering," prepared by Harold V. Coes, vice-president of the Belden Manufacturing Co., for the American Management Association, the opinion is given that the present trend in management is toward scientific control through simplified but adequate means, scientific means to reward, the rapid extension of auxiliary devices and aids, emancipating man as a beast of burden, the mechanization of industry, with labor as the controlling means rather than the means itself. In the author's opinion, there is one great danger to avoid, and that is the mistaking of the form, type, and means of management, be it in production or in any other phase of industry, for managerial skill and leadership.

"The real work in the future," says Mr. Coes, is the balancing of all phases of management in production and distribution. Repeatedly we find one plant stressing wage incentives while their indirect expenses from other causes, such as lack of or inadequate materials handling systems, are out of all proportion to the best or average.

"The rapidity with which invention succeeds invention, discovery piles on discovery, production method supplants production method, places a greater burden on management with the injunction that we shall keep our minds open, our forces mobile, our production methods and equipment flexible.

"One of the outstanding characteristics of American industry is its adaptability to shifting and sometimes rapidly changing conditions. Our English cousins marvel at this, and stand entranced with the way we scrap what appears to be perfectly good equipment, methods or even plants, for the sake of increased production and lower costs. They fail to realize that readiness of the financiers to accept the engineers' substitution of best for better, the workers' acceptance of the newer method or increased producing plan for the old, managements' acceptance of both, and the co-ordination of all, is the principal reason for our outstanding success."

Supplanting Hand Scraping With Grinding

In modern machine production hand work is eliminated wherever possible, and scraping is only another hand operation that is doomed

ONE of the few still surviving hand operations in the machine shop is the finishing of machine ways, especially the flat bearings and bevel slides on machine tool castings. There are machines that eliminate the greater part of hand scraping, but only recently has it been demonstrated that all of the hand work can be done away with, where the amount of scraping justifies the expense. That this is now an accomplished fact is shown in the accurate results in way grinding being obtained at the plant of the Bullard Machine Tool Co. The experiments of this company with way grinding have been so successful, and such accurate and satisfactory plane surfaces have been obtained, that it is expected that within a short time all hand scraping operations can be eliminated in the production of its own machine tools. Way grinding is a finishing process intended to replace scraping, and nothing else. No appreciable amount of stock is removed in this grinding operation, and it does not do away with planing or milling any more than does the original operation of scraping. The advantages are that the work can be done faster and more uniformly accurate than by the hand scraper. It, therefore, does away with a difficult operation in the shop, placing it on a more mechanical and reliable basis. The question of cost in the production of accurate machine tool ways is secondary. But it has been shown conclusively that way grinding has cut costs in many cases 75 per cent, or even more, by speeding up the work and cutting down the amount and the time of the work required in process.

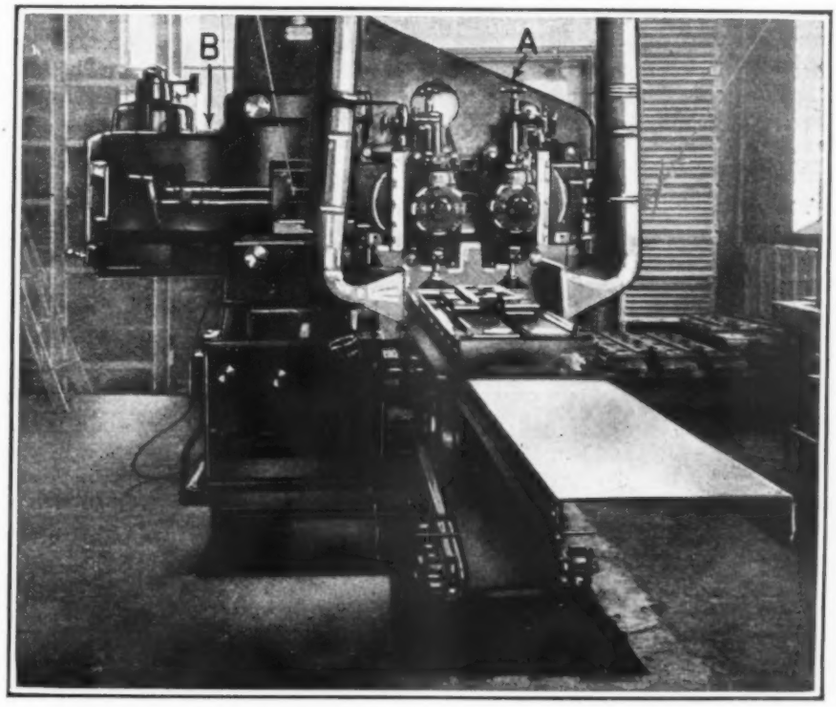


Fig. 1—Machine for grinding machine tool ways

In this precision work, the possibility of replacing the hand labor by grinding is dependent largely upon two points. In the first place, it is dependent on whether the tool employed can be guided with sufficient accuracy by mechanical means. In the second place, the tool itself must be able to retain its accuracy of form in order to secure the uniform production. The abrasive wheel alone seemed capable of solving the problem, but this class of production grinding, as far as accuracy is concerned, had to be placed in the category of toolroom grinding, and considered in terms of accuracy rather than in terms of quantity of metal removed. To obtain surfaces of suitable characteristics, and to prevent heating with consequent distortion, cup wheel grinding with very slight feed was adopted. Relatively low work speeds were also used, and this, combined with the small feed, would have made a low rate of production in the grinding of machine ways were it not for the fact that the whole width of way is covered by the wheel. This grinding of the entire width at one time was adopted as the only practical method of obtaining a truly plane surface with the type of finish required for a machine tool way.

A point of argument in favor of hand scraping on machine ways has been the nature of the scraped surface, giving a multiplicity of minute high and low spots which were claimed to be a great aid in keeping the ways of machines properly oiled while in action. Grinding with

the cup wheel over the entire surface at one time has been found to give a still better surface as regards lubrication. Instead of being highly polished, with the surface grain running only in one direction, the ground surface of the way is covered by a series of cross arcs of almost infinitesimal depth. Instead of being of irregular and varying depth, as in hand scraping, they are of uniform depth on a perfectly plane surface.

The machine now being used for way grinding by the Bullard Machine Tool Co. is a German built machine development by the Schmirgelwerk Dr. R. Schoenherr, Chemnitz, whose agent in this country is L. Sichel, 200 Fifth Ave., New York. It is of universal type, and is illustrated in Fig. 1. The work is held on a traversing table, and the grinding heads are supported in a double-arm radial standard. One arm *A*, of the radial has two universal wheelheads in which the cup wheels are used. The other radial arm, *B*, supports a heavy-duty, vertical surface grinder intended for wide flats, which will grind flat ways up to 26 in. in width. The arm and face grinder is shown swung aside at *A* in Fig. 2. For this wide work a segmental wheel is used instead of a cup wheel, but the wheel will produce the same class of surface finish as is obtained on the smaller work.

The grinding heads, including the large segmental wheelhead, have built-in motors integral with the grinding wheel spindles. The spindles have tapered roller bearing seats, which are claimed to give very accurate adjustment from the ends of the spindles. The small wheelheads can be swiveled in a complete circle, and can be adjusted lengthwise along the rail in any position. One of the spindle heads is shown set at an angle in Fig. 3. The two heads can be accurately synchronized in position by very sensitive levels placed around the heads. Due to great accuracy in the machine construction and careful attention to the correction of wear, it is claimed that the machine will produce work with a uniformity within 0.0004 in. in 24 feet.

The machine can be used to advantage on small work

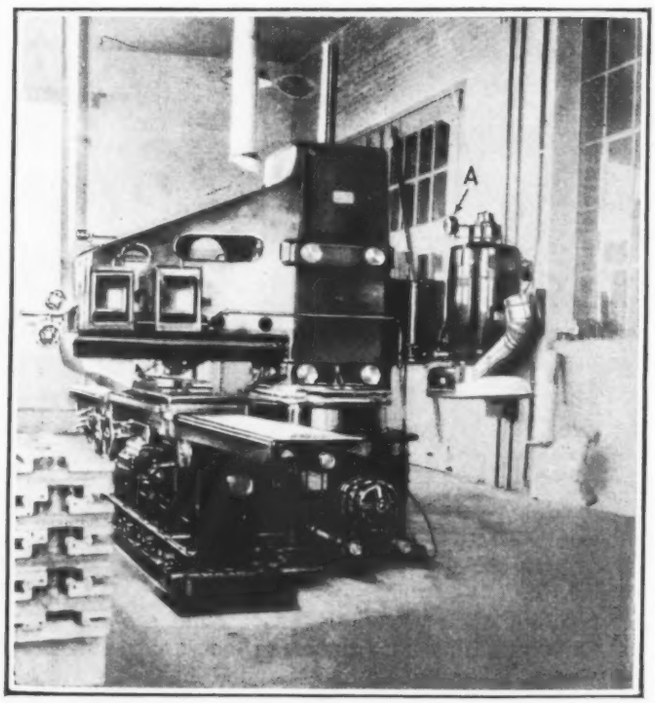


Fig. 2—Back view of machine showing swiveling arms

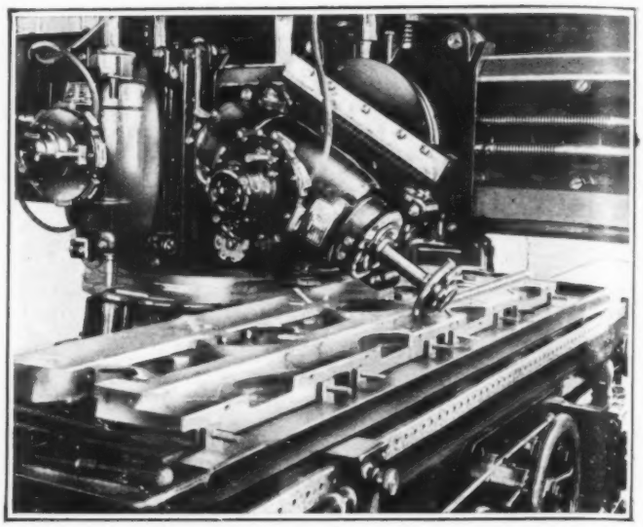


Fig. 3—Spindle head set for angle grinding

where there are many duplicate parts to be ground, so the set-up time can be distributed over a large number of parts. The long table of the machine permits the setting up of two or more parts for grinding, and thus cuts down proportionately the average set-up time. The table is guided upon the bed in such a manner that a full-load bearing can be obtained even at the extreme position. On longer work where no ganging is done greater savings are made because the set-up time and reduction in mechanical losses is proportionately reduced.

Special Single-Purpose Machines

The natural development for firms having a large number of small parts will be the application of single-purpose machines of special design. This is already incorporated in the production plans of the newly created way-grinding department at the Bullard plant. The importer of the machines claims that they can be supplied in either single purpose or universal form to meet the individual requirement of machine tool builders.

The adoption and perfection of way grinding in machine tool building is undoubtedly bringing the principle of mass production to one of the most important and most difficult operations in the machine shop. The saving in labor will be no small item in the ultimate outcome, and the cutting down of the necessary amount of work in process will doubtless mean a large saving in costs. But probably the point of greatest interest at the present time is the great accuracy, the uniformity of product, and the high class of bearing surface that it is possible to obtain by this form of grinding.

Care of Pneumatic Hammers

By August Jeffers

MANY pneumatic hammers are injured by using chisels having shanks that are too small, or that are tapered or rounded. The shanks should be kept square and to size.

If the shank fits the tool too loosely, it will cause the bushing to wear out in a short time. If the shank is allowed to wear tapered or rounded, it will go into the tool too far, reducing the strength of the blows, and may break the teat of the hammer.

Liability of Contractors for Infringing Patents

By Leslie Childs

WHAT constitutes the infringement of a patent is a question of considerable importance to contract manufacturers. This is true because, by the very nature of enterprises of this kind, they may frequently be called upon to rebuild, repair or replace patented machinery and equipment. It follows that a working knowledge of what may amount to an infringement, in situations of this character, may prove worthwhile insurance against being drawn into expensive litigation over the point.

The infringement of a patent consists in the unlawful making, selling or using of a patented invention. There is also what is termed "contributory infringement," which consists in the intentional aiding in the violation of a patent by making or selling a part of a patented article. It is obvious from the above that everyone knowingly concerned in the outright unauthorized making or reproducing of a patented invention may incur liability as an infringer. However, the further question of when the making or selling of the parts of a patented article will constitute contributory infringement is one of great difficulty and cannot be covered by any hard and fast rule. But as a guide in cases of this kind, the following general rule may be given for what it is worth. Broadly speaking, when a person comes into possession of a patented invention which embraces several elements, as most patents on machinery do, he has the right to make reasonable repairs in order to prolong the life of the article. However, the right to repair or replace must not extend to reconstruction or reproduction, and when repairs or replacements reach either of these points they may amount to an infringement.

> The purchaser of a patented invention has a right to make reasonable repairs in order to prolong the life of an article, but the right to repair or replace must not extend to reconstruction or reproduction. The law on this question may well be borne in mind by contract manufacturers who contemplate engaging in work that involves patented machinery

So much for the general rule, and now as an illustration of its application to a case in which repairs were held not to constitute an infringement, let us examine Goodyear Shoe Machinery Co. v. Jackson, 112 Fed. 146. In this case the defendants were engaged in the general jobbing and repair of machinery, and the complainant was the owner of patents covering a machine known as the Lincoln machine. Certain purchasers of these machines contracted with the defendants to have repairs made, which consisted in replacing worn parts. The complainant, as owner of the patents, contended that the acts of the defendants in doing this work amounted to an infringement of his patents, and brought the instant action to restrain such work.

Now, at this point, it may be noted that the patent involved was composed of a combination of elements. That is, the entire improvement, as embodied in the machine, was patented, and the principal claim of infringement was based on the acts of the defendants in replacing cams in the machines, the office of these cams being to control the movements of the needles when the machines were in operation.

Upon the trial of the case, the trial court held there had been no infringement in the making of these repairs. On appeal the higher court in reviewing the record, and in affirming the decree of the lower court, in part, said: "When the purchaser bought a Lincoln machine, he bought a machine which embodied all the elements in the patented combination, with the right to use that combination as a whole until it was worn out. He had the right to repair partial injuries to the combination arising from wear and tear, and so refit the machine for use, though it involved the replacement of an essential part of the combination. To prove that the purchaser of a Lincoln machine infringed this patent, it must be shown that the repairs on his machine involved a substantial reconstruction or reproduction of the patented combination which was sold to him, and which became his absolute property. . . .

"The charge of infringement of this claim is substantially limited to the replacement of the cam which moves the carrier to and from the curved needle. But this cam is only one of the material elements of the patented combination. . . . The breaking or wearing out of this cam resulted in only a partial destruction of the patented combination, and its replacement by a new cam was plainly a restoration, and not a substantial reconstruction of the combination. . . . We are of the opinion that the purchasers of the Lincoln machines, by repairing their machines to the extent disclosed by the evidence, have not infringed any of the patents in suit. . . . "

So much for the foregoing case, and now let us examine a decision involving repairs and replacements on a

patented invention that was held an infringement. For this purpose Morrin v. Robert White Engineering Works, 138 Fed. 68, will serve. In this case, the complainant was the owner of letters patent covering a certain steam generator, or boiler. And the vital element of the invention involved consisted of the tubes and their arrangement within the shell or cylinder.

Some years prior to the bringing of this action, two of these boilers were installed for the Terre Haute Electric Co., two for the American Manufacturing Co., and one for Wurster & Co. After these boilers had been in use a number of years, the defendant began taking contracts to make repairs thereon and replace tubes therein as occasion required.

Pursuant to these contracts, the defendant replaced in each of the Terre Haute Electric Co.'s boilers 450 tubes, which was but 25 less for each cylinder than was originally provided. The defendant also renewed 4 tiers out of 19 in the boiler of Wurster & Co., and contracted to furnish the American Manufacturing Co. a total of 1,063 tubes for its two boilers, for $3.25 each, with additional sums for labor on each boiler.

At this stage of the proceedings, the complainant, as owner of the patent on the boilers, brought the instant action against the defendant for an injunction. The action was predicated on the claim that the contracts of the defendant to make repairs and replacements, as has been outlined, constituted an infringement of the complainant's patent. Following a review of the record and authorities, the court in stating its conclusions, and in finding in favor of the complainant used the following language: "The conclusion is reached that the defendant was not permitted to replace the tubes in the Terre Haute & American Co.'s boilers. But suppose that one tube fails in use! May the defendant supply it? If he may supply one, how many more may he supply before he reaches the point of infringement? For instance, in the present case, when the Wurster boiler was dismantled, the defendant supplied 4 out of 19 tiers. The evidence seems to indicate that it would have supplied more, had it not been enjoined. Was that infringement?

Not an Emergency Repair

"It seems illogical to hold that the defendant may not supply the whole 19 tiers, but may provide 4 tiers; that is, that it may carry on the business of supplying tubes, provided it keeps within certain limits. The supply was not for an emergency. It is not as if a tube or a few tubes had broken, and in an exigency the purchaser applied to a local mechanic to supply them.

"What would be equitable in such an instance need not be determined, for here the defendant has entered the business for the general purpose of supplying tubes, few or many, and should be enjoined from such general business. Its whole attitude is that of a trespasser. Hence the complainant should have a decree against the defendant, enjoining it from supplying tubes for use in the patented generating cylinder."

The foregoing decisions constitute a valuable cross section of the law on the question of patent infringements as applied to contract manufacturers in repairing, replacing or otherwise working on patented machinery or equipment. These cases are considered leading, the opinions rendered are exhaustive and well reasoned, and the holdings announced are unquestionably in accord with the weight of authority.

It is of course obvious that the subject involved is one of great difficulty, and that each case of this kind must necessarily be decided in the light of its attendant facts. And while the cases reviewed are not put forward as announcing rigid rules that would apply in all situations, they do constitute striking illustrations of judicial reasoning on the subject in hand.

Certainly, in view of the language of the courts in these cases, which has been quoted at some length, a contracting manufacturer may well use some discretion in entering into contracts for the reproduction of, or extensive repair or replacement work on, patented machinery at the instance of a person or firm not the owner of the patent. At any rate, such a contracting manufacturer should be sure of his ground before work of this character is undertaken on any very large scale, since it is possible for considerable loss to be sustained.

This is true because, if the work is in fact unauthorized and is of such a character as to be an infringement of a patent, the chances are good that the manufacturer will be called to account. This may then lead to long-drawn-out, expensive litigation that may usually be avoided if due care on this point is exercised when contracts are undertaken. Truly, the law on the question, as exemplified in the cases reviewed, may well be borne in mind by contract manufacturers in general when contracts for extensive work on, or involving, patented inventions are being negotiated.

The Economics of Machine Tool Replacement—*Discussion*

By L. L. Thwing

IN THE article on page 347, Vol. 67, of the *American Machinist,* Myron S. Curtis' definitions of obsolescence are not in entire accordance with the rulings and practice of the Income Tax Unit of the Treasury Department. The Income Tax Unit stated in 1920 that "obsolescence means the gradual reduction in the value of property due to the normal progress of the art in which the property is used, or to the property becoming inadequate owing to the growing needs of the business." This definition is in accordance with nearly all writers on the subject. Practically, it urges that any loss of value due to use, or wear and tear, be kept distinct and separate from such losses as do not depend on these factors. We have a rough idea of the annual depreciation of machinery and appliances in the various industries, but the rate of obsolescence cannot be based as directly on experience, because no one knows when a new machine or new processes will appear. The need for repairs shows itself in a very definite way. On the other hand, there are many smoothly running machines that turn out work enough to avoid criticism that are actually obsolete. The results, however, could always be found in the balance sheet, if the sheet could be analyzed closely enough.

Obsolescence being so elusive, and yet so vital, let us keep it as a clear-cut issue, and not something indefinite to be added to depreciation. The Treasury Department started out in 1918 to include obsolescence as a part of depreciation, but it apparently discovered before 1920 that this was not practical, and since then obsolescence has been treated as a separate issue. For tax purposes it must be on a separate page of the ledger. It is probable that if every industry had a separate obsolescence account more attention would be paid to this factor.

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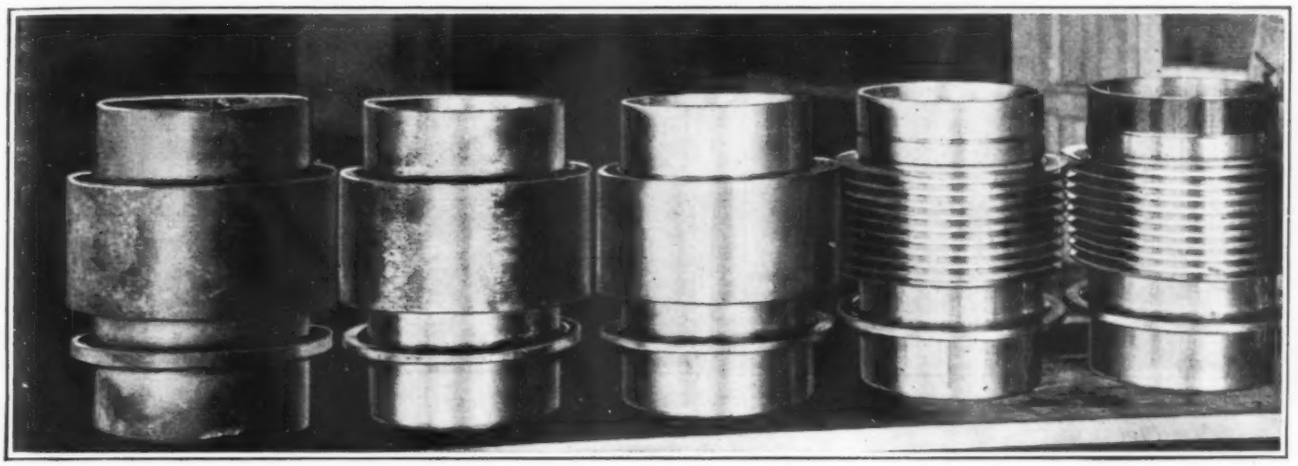

Fig. 22—Five stages in the evolution of a cylinder barrel

The Air-Cooled Radial "Wasp"

Cylinder barrels are steel forgings

By Ellsworth Sheldon
New England Editor, American Machinist

CYLINDERS for the Wasp engine are made in two parts. The barrels are received at the factory as tubular forgings of alloy steel, on which are to be machined from solid stock the thin fins necessary to conduct away and dissipate the heat generated by the burning fuel. The heads are aluminum castings having similar fins integral with them. The barrels and heads are machined as separate parts up to the time of grinding the bore, just before which operation the heads are heated to about 300 deg. F. and are shrunk on to the cold barrels.

In Fig. 22 may be seen the five principal stages in the evolution of a cylinder barrel. At the left of the row is the steel forging, which, before any work is done upon it, is Brinell tested and subjected to careful inspection calculated to bring to light any possible defects. To the right, successively, the barrel may be seen bored and partly turned; with the contour fully turned; with the fins formed on the body, and, at the extreme right, as it appears when ready for the shrinking operation that joints it permanently to the head.

For the first machining operation, the forging is set into a universal chuck with three special, deep jaws, as may be seen in Fig. 23, the chuck grasping it by the middle shoulder that is to be grooved to make the fins in a later operation. The machine employed is a Gisholt turret lathe.

The fifth article. The sixth will appear in an early issue.

The operations at this stage include roughing and finishing the bore; rough and finish turning a part of the outside diameter—including the flange by which the cylinder will be attached to the crankcase of the engine; facing the end of the barrel; and chamfering inside and out to an angle of 45 deg., $\frac{3}{32}$ in. deep.

The roughing cut through the bore is made with a multiple-tool boring head mounted upon a piloted bar that is held in the turret, and is guided by a bushing in the machine spindle. A second bar, held and piloted in the same manner, carries the usual form of double-end boring cutter to make the finish cut. The finish size is not arbitrary at this time, since the actual finish is by grinding after the head and barrel have been assembled, but it is calculated to leave about 0.025 in. of material for the grinding wheel to remove.

The facing, turning, forming and chamfering tools are held by the square turret on the cross-slide of the lathe and are in action while the boring cuts are being taken, the time of the boring being the full time of the operation. The work on the outside of the barrel is carried as far back as the chuck jaws will permit.

The following operation is performed automatically in a Duomatic lathe, the operator having only to secure the piece in the machine and to put the cycle movement in action. The work is held in an adapter, the feature of which is an expanding mandrel, that attaches to the spindle of the machine. By reference to the

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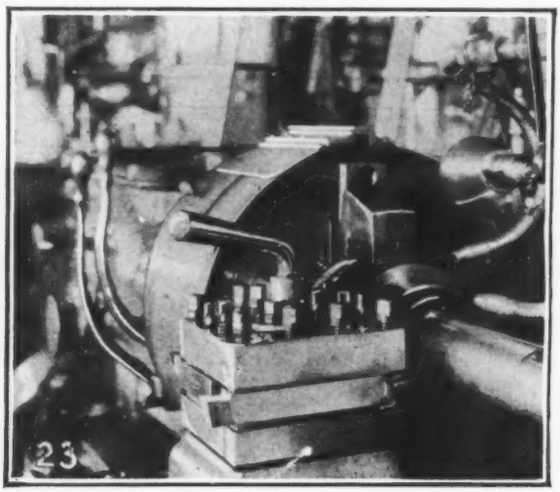


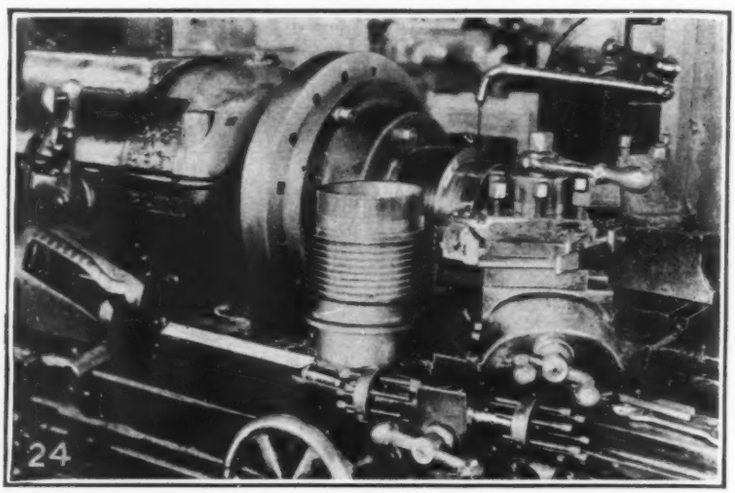


Fig. 23—Forgings are held in special, deep-jaw chucks to bore them. Outside diameters are turned back as far as the chuck jaws will permit. Two operations are necessary to complete the work. Fig. 24—The shoulder of the barrel is turned and a 12-pitch thread is cut over a part of its length. The head is bored and threaded to correspond. Both parts are accurately fitted to gages. The head is shrunk on the barrel at a heat of 300 deg. F.

middle one of the row of barrels shown in Fig. 22 it will be seen that the part comes from this machine with all of the outside surface turned. The middle shoulder by which the work was held in the chuck in the first operation is now tapered $\frac{1}{2}$ in. over its length.

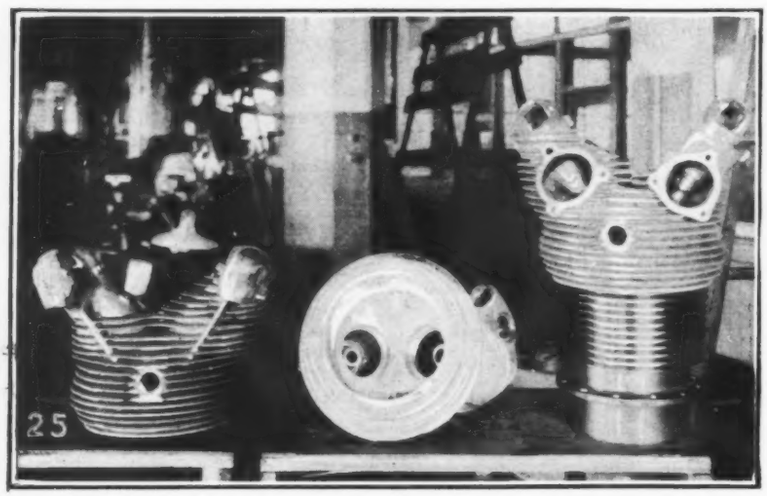
A second Duomatic lathe performs the third operation, which is to cut into the middle shoulder the grooves that separate it into fins. The holding fixture for this job is also an expanding mandrel like the first. Parting tools in the front and rear toolblocks of the machine work together, the tools of one set being somewhat narrower and set slightly to precede those of the other set. The tools of the second set are also tapered slightly, widthwise, and act as forming tools to make the fins between them somewhat thinner at their outer diameters than at their bases.

The amount of draft, or taper, of the individual fins is $\frac{1}{32}$ in. They are also rounded in the edges, and join the body of the cylinder with generous fillets. A tool in this set-up also puts in the round-bottomed groove to be seen near the top of the barrel, which is merely a clearance groove for the threading tool of the next operation.

An adapter on the faceplate of the lathe shown in Fig. 24, holds the partly finished barrel by the flange end while the shoulder to be threaded is finish-turned and the thread is cut. That part of the shoulder lying between the threaded portion and the first fin is also turned to fit a snap gage, since this part of the diameter is an important part of the shrink fit by which the head is joined to the barrel.

All sharp corners are broken at this stage by hand filing, the outside surface is polished with abrasive cloth, and except for drilling the holes in the flange for the attaching bolts—which job is done at a much later stage and after the head is put on—the barrel is practically finished so far as machine work is concerned. It is washed in kerosene and inspected for cracks, which, if they exist, will show up very prominently because of the exudation of oil on the polished surfaces.

The cylinder heads—bored, threaded and very carefully fitted to gages—are joined to the barrels by the



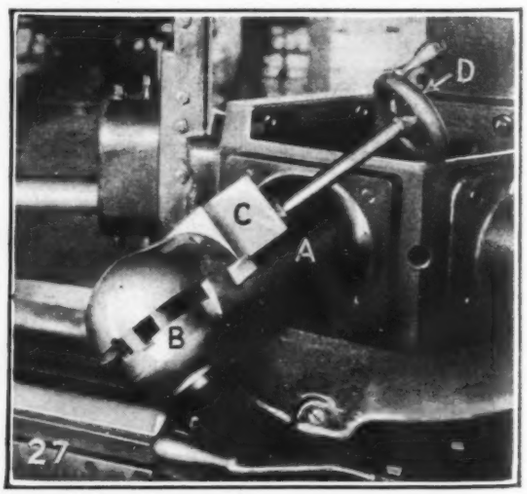


Fig. 25—Cylinder head and assembly of cylinder. Fig. 27—Details of the doming tool

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shrinking process. They are raised to a temperature of about 300 deg. F. in an electrically-heated oven, and while hot are screwed tightly upon the cold barrels, making a very dependable job and one that cannot be broken without destroying one or other of the parts. In Fig. 25 may be seen two views of a head ready for the shrink, also a complete cylinder.

The shape of the cylinder head—with the bulbous swell of the combustion chamber; the fins of varying diameter to conduct away the heat; and the projecting walls surrounding the cored pockets that are to enclose the valve-operating levers—makes the part a very difficult one to hold for machining. The fixture to be seen in Fig. 26 mounted upon the spindle of a Warner & Swasey turret lathe, makes it possible, however, to do all of the interior work at one setting.

The operations at this stage are: to face off the casting where it joins the shoulder of the barrel; machine the parallel portion of the bore and cut the threads therein; machine the hemispherical inner-wall of the combustion chamber; and to drill, bore, ream and counterbore the holes for valve seats and valve-guide bushings. These holes are disposed at an angle of 35 deg. on each side of the center line of the cylinder, and must all be completed at one setting in order to insure their proper relation, therefore, the holding part of the fixture must be capable of swinging to, and locking in, two positions 70 deg. apart, as well as of locking in mid-position.

Balanced by Counterweight

Since the holder and work when swung to the offset position in either direction are very much out of balance, the circular plate *A* in Fig. 26 is provided with a movable counterweight that is shifted each time the position of the work holder is shifted, in order to bring the rotating mass into balance. The yoke *B*, pivoted at one end and clamped at the other by a hinged bolt, secures the work-piece rigidly between itself and the body of the holder, while a spring-actuated locking pin fixes the holder itself in any one of three positions.

With the holding part of the fixture locked in mid-position, the parallel bore of the work-piece, corresponding with the threaded shoulder at the upper end of the cylinder barrel, is co-incident with the center line of the lathe and is rough bored in that position. The radius turning tool, held in the turret of the lathe, is brought into place in the bore and the hemispherical wall of the combustion chamber is machined.

Two cuts are made over this portion without other change than to substitute for the roughing cutter, a slightly longer tool. Both cutters are of the right length and both abut against a fixed stop, so that with the longer cutter in place of the short one, the turret-slide stop again positions the doming tool to remove the predetermined amount of stock on the second cut.

The doming tool, shown in large scale in Fig. 27, consists of the bar *A*, the rounded end of which is slotted transversely to receive the disk *B* in which the active cutting tools are secured. An angularly disposed slide *C*, actuated by the handwheel *D*, carries a short rack to mesh with pinion teeth cut into the periphery of the disk, so that the latter may be rotated one-half turn about its own axis. After the doming cut has been

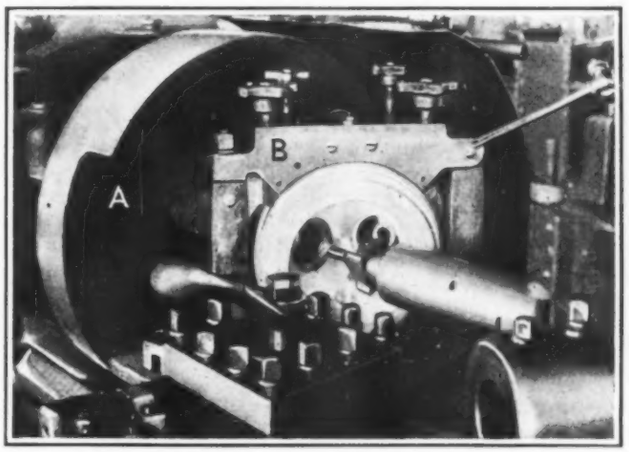


Fig. 26—Three-position fixture in a Warner & Swasey turret lathe allows machining to be done upon the cylinder head at three separate angles without resetting.

finished, the tools of the cross-slide are brought into action to face, to finish the parallel bore, and to cut the thread.

The holder is now unlatched and swung to one or other of its 35-deg. positions, where the remaining tools of the main turret are used to drill, bore and ream the hole for the valve-guide bushing, rough out the recess for the valve seat—which is a separate piece of phosphor bronze composition, set into place in a later operation—and undercut the recess, so that the metal may be rolled over the valve seat to secure it in position.

The fixture is then swung 70 deg. to the opposite position and the operations repeated upon the other hole.

Fifty Years Ago

(From early numbers of the *American Machinist*)

THE Baldwin Locomotive Works has received an order from the Russian Imperial Government for forty of the largest sized engines to be completed by March, 1878. The value of the engines will be over half a million dollars.

We have made a careful inquiry at the principal machine shops in New York in regard to wages paid. The journeymen machinists average $15 a week, pattern makers $18 and boiler makers $12 to $15 a week.

E. Gould & Eberhardt, of Newark, are employing about 40 men in their works. They have established quite a trade in South America.

The Pratt & Whitney Co., Hartford, has unique automatic machinery for threading taps, the invention of J. J. Grant, who has charge of that department.

The Trenton Iron Co. recently rolled in one of its rod trains 39,875 lb. of No. 4 wire rod in 9 hours. This is claimed to be the fastest time ever made on wire rod rolling.

P. Jewell & Sons, Hartford, are exporting leather belting to nearly every civilized country in the world.

THE · FOREMAN'S · ROUND · TABLE

Insurance and Savings in the Shop

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

"MET up with a queer case the other day, Al, over at that auto parts shop I visited."

"What was that, Ed?"

"Seems they have about fifty employees, and the story goes that the foreman of the machine room noticed that his apprentice boys never saved a cent, spending their money in foolish ways every pay day. He suggested to the young fellows that they put up a box in the department and each put in a quarter a week, the foreman joining in himself. They did it, and opened it up at Christmas time. The boys said it was like getting money from home, so the following year they all favored making it a dollar a week.

"Well, that started something. The third year all the mechanics wanted to join in, so the foreman organized it on a business basis, arranging with one of the banks on a Christmas Club basis for accounts in the names of all the men who wanted to join. Then he elected one of the boys to collect the dollar every pay day."

"Sounds interesting, Ed."

"But hold your horses, Al. That's not all. When the company heard about it they got busy and asked the whole bunch how they would like to join in on a combined endowment and group-insurance plan that the insurance companies are offering to industrial plants.

"Well, they fell for it to a man. Seems the company insures the plant as a unit, the men paying part and the company paying a percentage depending on the length of service. It covers health and accident insurance, a death benefit, and an endowment after a number of years. The company officials say they like the endowment plan as it encourages thrift and makes the men feel more independent."

"So they all like it, Ed?"

"Wouldn't say all, Al. Not too convinced, myself. I'm not so sure that the foreman or the management ought to butt into the private life of the workman. How does it strike you?"

"I think you've struck on one of the big problems of the day, Ed. Employer and employee live together and have common interests the best part of the twenty-four hours of the day, and I don't see why they can't work together on a thing like this that will make contentment all around. Many a man who would not go to a bank will pay into the shop insurance scheme. You know that a workman who saves his money and gets the fear of sickness and run-down old age off his mind is more valuable to himself and to the shop than if he were continually worried. He won't be ready to quit the job he likes for a few cents extra pay, either. But it's an open question, all right."

Was the foreman at the auto parts shop wise in encouraging thrift amongst the boys?

Is the workman who lives hand-to-mouth doing justice to himself, his family, and the company?

Was the company justified in organizing thrift on a business basis?

All foremen are urged to discuss these questions. Acceptable letters will be paid for. The discussion is not limited to foremen, of course

Discussion of Earlier Topics

Receiving the New Man in the Shop

THE need of judgment and insight into human nature remains the most important feature when receiving the new man in the shop. An arrogant, blustering attitude does not pay dividends, nor do ways which are too liberal and timid; but it is desirable that an attitude be maintained which commands respect and at the same time displays a friendly personal interest. The treatment of a newcomer should vary according to his personal characteristics and experience. If the man is young, intelligent and frank, with a good knowledge of shop practice, some allowance can be made for lack of skill in certain operations, inasmuch as modern shop practice includes a large field and he may have had the disadvantage of having spent much of his time in poorly equipped or managed shops and therefore is lacking in some respects. However, the right sort can be developed into valuable men in a short time by a good leader. To judge a man entirely by his first job is unfair. If a man happens to do one task with which he happens to be familiar, well, it cannot be assumed that he can do all tasks in the trade well. Often, because of a sensitive temperament, he cannot do justice to himself at the start when trying to make good in strange surroundings while sensing the critical thoughts of the foreman and other workmen. On the other hand, the loud, talkative fellow who often talks to cover up his weaknesses, does not deserve as much tolerance but should also be given every opportunity to "deliver the goods."

—GEORGE BUSCHERS.

Receiving Personal Mail in the Shop

YES, I think the men were justified in their complaint. It's the very man who does not make a practice of getting mail in the shop who would be most likely to overlook a special rack, since he is not expecting mail at any particular time. He's probably the same fellow who would stay over 10 or 15 minutes to finish up a job, and when the firm uses school-boy tactics and denies him a few minutes for mail on a special occasion, he invariably compares the two situations and resents it.

I believe that inasmuch as the foreman is the man who is depended upon to secure and hold the men's good will, it would only be logical to give him this opportunity to show his interest in the men. After all, the foreman should be helped to win the men's loyalty by the management, rather than forced to try to hold it despite the management's lack of good judgment.

Goodwill is an intangible thing, hard to measure; but, it means many dollars on the right side of the ledger. Money saved is easily measured; but, it must be in appreciable amounts before it should be permitted to come into conflict with loyalty and goodwill. Money saved by forbidding mail distribution is not appreciable, and is not worth the cost in loss of factory spirit.

—W. F. MICHAEL.

Using Makeshift Tools

THE "whether or not" of a makeshift tool is usually tied up with costs and goodwill and both need consideration for present and future. If the makeshift helps to carry on the works which would otherwise have to close or slow down, a makeshift costing more than a proper machine, if this were not obtainable immediately, would probably be the least costly in the end. Also, if the makeshift helped to create the goodwill of the customer by giving earlier delivery, a little extra expense might be money well spent. In either case it is seen that the long view as well as the immediate one must be taken. Most engineers take a pride in making a machine or tool do something which is different to that for which it was originally intended, and probably many new ideas have been evolved in this process, but this sort of thing is, in the main, for the experimental shop and not the production department. There are, of course, cases where a special fixture for a job, applied to an old machine, which perhaps merely supplies the power transmission and the support from the floor, is truly economical and may, in fact, amount to a special machine for the job, and Ed's idea may have been such. He should have supplied figures to support his idea in using the old drill press. "Fudging up" is a habit which is likely to grow on one, and should be watched closely. Darned socks and patched pants may be an economy, but they have a certain demoralizing effect.

—ALBERT F. GUYLER, *England*.

THE : NEXT : TOPIC

Keeping Track of Improvements

ADVANCE QUESTION

Where the shop experiences difficulty in getting a hearing on improvements in the product, what is the best method of following up an idea that originates in the works?

Hiring Back the Fired Workman

OCCASIONALLY the foundry had to make some parts with a thin arm core that was set on chaplets. Setting of the cores was difficult, and additional trouble was experienced due to the breaking of the arms, causing further labor in respooning the molds. This being a piece work job, and orders coming through in regular lots of six hundred, the foreman decided that each molder would have to take a lot in turn.

When the turn of Jake, the best molder, came, he went to the foreman. "Ben! I am not going to mold those parts with the thin arm core."

"So you have made up your mind to pass the buck onto the other boys?"

"Not exactly like that—but—"

"Shall I have the clerk go with you, or do you know the way to the payroll department?"

Jake knew enough to quit without argument.

In about four months Jake met Ben on the street.

"Say Ben, you haven't anything against me as a molder have you? How about a job?"

"No, Jake, but there is only one job, and you couldn't do that."

"I couldn't, eh. What is it?"

"Run six hundred thin arm parts."

Jake came around Monday, started on the parts and put them through successfully, but when he found out that Ben did not need that lot of six hundred, as an order had just been completed, he said to the other boys, "You've got to go a long way before you get ahead of Ben." —J. A. POTTER, *Chief Draftsman.*

Keeping Down the Work in Process

THERE is no one in a better position to keep down the work in process, and keep it moving through the shop, than the foreman. A good supply of material assures the constant running of machine tools without frequent changes, and constant running means low production cost. The line foreman will keep a regular stream of work moving through his department if he is not handicapped by red tape. I have known whole engines to be held up for a week for want of lubricators. It is better to have a few details hanging about than a whole machine waiting for one article to finish it.

—H. MAPLETHORPE, *England.*

THE way to reduce the amount of work in process is to arrange the factory schedule so that the material, method of production and tools for each operation will be ready before the shop starts work on the order. The following routine describes a successful method:

As soon as the order is written, it is sent to the tool department where each item is checked for tools. If the tools cannot be obtained in time to meet the delivery specified, the sales department is notified and the date when tools will be ready is placed on the order, which is then sent to the material department. This department arranges to have the stock delivered to the shop on a certain date, and the order continues to the schedule department where authorizations are issued to the shop.

When the material arrives in his department, the foreman refers to his operation sheets, and requisitions the necessary tools. He then starts to work on the piece.

—H. C. KLINE.

Applying the Budget to Small Tools

I BELIEVE that Williams is on the right track when he is proposing to budget small tools. Although it requires considerable effort at times to induce the management to purchase tools, when the money spent arrives in the shop in the form of drills, taps, etc., the workmen seem to lose all respect for the money value represented by them. Some men, too, always like to have extra drills in their lockers, "just in case of accidents."

Where there is an epidemic of broken drills or taps it is certainly up to the foreman to inquire into it. The budgeting of small tools is one way of asking the foreman for his co-operation. It is not the purpose to save an odd drill or a tap at the expense of production. Breakages cannot be avoided once in a while, but where these are high there is something wrong, and the fault should be found. —JAMES C. HARPER, *England.*

Tool Sales in the Shop

PRIVATE sets of tools should be encouraged in a friendly manner, but pressure should not be brought to bear on the man who does not have all of them. It is better to establish a minimum set of tools, such as is commonly regarded as the "stock in trade" of a mechanic, and advise the men that the company does not propose to furnish them, except in an emergency. Then it should be left up to the man himself as to how he will meet the situation.

Forwarding purchasing orders for the men is hardly a paying proposition, for the company is bound to spend more money in handling the orders than the men will save over the retail price. It would be better to give the money that would have been expended to the men each year in the form of a tool bonus, either in cash, or as an order on a local hardware dealer. —J. B. FLOWERS.

IF THE machinists insist on owning the tools with which they work, the purchase of these tools should be controlled by the shop. This can be done by requesting the men to buy through the company's purchasing agent. Every tool entering the shop will then be up to standard. After the tools have become a factor in the process of production, and are in actual service, a periodical inspection should be made so that the standard which has been established will be maintained. The important point is that the tools be kept in perfect condition to insure the greatest possible degree of efficiency and accuracy, and, regardless of ownership, the shop should control and maintain these instruments. —ROY E. PETERSON.

Looking Beyond the Department

THIS is a case where more might have been done by the foremen if the big boss had taken them into his confidence, showing his hand plainly by unfolding to them his ideals and asking for their co-operation to that end. The average foreman has his hands full in any case, and most of them know from past and sad experience what they may expect from the wrong kind of a big boss. Too often many a foreman receives, not encouragement, but that faint praise which is virtually a condemnation.

Good men are generally ready enough to contribute what they may, once a definite lead is given them from above. However, one might state that only the suggestion schemes which are nursed by the higher powers of the company have any real chance of succeeding. Such a lead from the big boss fires a foreman's imagination and kindles his zeal. —W. ROLAND NEEDHAM, *England.*

Ideas from Practical Men

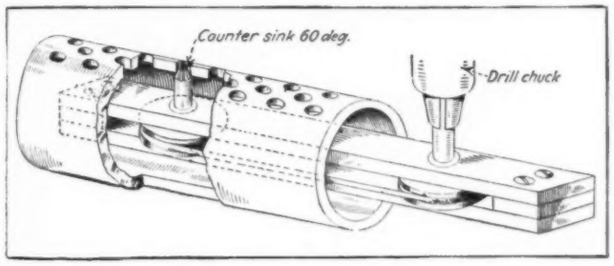
The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upward, depending upon their merit

A Tool For Burring Holes in Tubing

By H. L. Wheeler

The tool shown was made for burring holes drilled in brass tubing that is part of a valve used in a certain type of hydraulic elevator. The tubes are drilled in small lots and must be free from the burrs left from drilling.

The tool is made from two pieces of cold-rolled flat stock ¼ by 1 in., separated by pieces of the same material



An interior burring tool

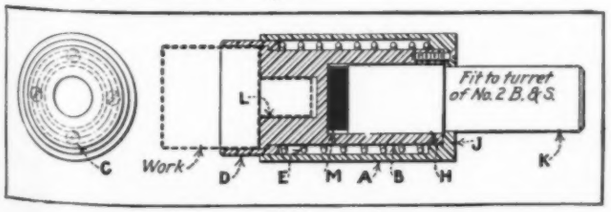
⅜ in. thick at each end, and held together with fillister head screws. Two grooved pulleys, one carrying a countersink and the other a shank that fits the drill chuck, provide rotation for the tool by means of a round, leather belt.

In operation, the shank of the driving pulley is gripped in the chuck on the drill press while the working end of the tool is allowed to float. The tubes to be burred are held in the hand and slipped over the end of the tool. With the machine in motion, the holes can be rapidly burred by a slight pressure downward.

A Chuck-Loading Fixture

By B. J. Stern

The chuck-loading feature illustrated is used in connection with a B & S automatic screw machine in machining the brass casting shown in heavy dotted lines. Since the cycle of operations in this machine is entirely automatic and is controlled by cams, it was necessary to provide means for automatically chucking the work at the proper time in the cycle.



Fixture for loading work in an automatic screw machine

The fixture consists essentially of the case *A* in which the sleeve *B* fits into a recess in the back, where it is retained by the screws *C*. The slide *D* is a slip fit between the case *A* and the sleeve *B*, being retained by the shoulder on the front part of the sleeve against which it is pressed by the spring *E*. The shouldered plug *H* projects through a hole in the case being a snug fit in the sleeve *B*, the shoulder thrusting against the back wall *J* of the case. The shank *K* is held in the turret of the machine.

In operation, the casting is slipped into the slide *D* in which its rough diameter is a fit, the projecting shank *L* being accommodated by a hole in the sleeve *B*. The turret of the machine being tripped by its cam at the proper time in the cycle, brings the casting in line with the chuck, after which it is brought forward until the work slips into the chuck jaws. When the work enters the chuck, the slide *D* is pressed back against the spring *E* by the jaws of the chuck until the forward action of the turret ceases. By this time the chuck has secured a grip on the work and begins to rotate it, at which time the loading fixture is brought back out of the way. The turret is now tripped and the finishing tools are brought into use. The rubber washer *M* between the plug *K* and the inner sleeve takes up any shock when the piece bottoms in the chuck.

Simple Method of Reducing Drawings to the Same Scale

By E. L. Fairall

Proportional dividers, the ordinary tools used for reducing drawings made to various scales to the same scale, are somewhat expensive and are seldom available in small drafting rooms. An equally effective method, which does not require any expenditure for special equipment, is shown in the sketch. On a sheet of tracing paper or cloth lay off any line *AB*, the length of which equals some known value in terms of the scale of one of the drawings. If the scale of the drawing is unknown, make this length equal to the length of a line of some known dimension of the drawing. At any convenient angle lay off another line

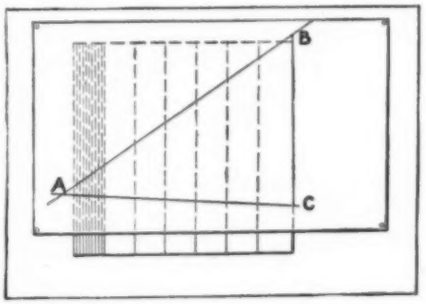


Diagram of the method

AC, corresponding in dimension to that of the first drawing but in terms of the scale, or proportional to some known dimension, of the second drawing. To illustrate: if the length selected was 24 in. then *AB* represents 24 in. in terms of the scale of the first drawing and *AC* represents 24 in. in terms of the second drawing. Connect the points *B* and *C*. Now by an old theorem in geometry any line drawn parallel to *BC* will divide the two sides of the triangle *AB* and *AC* proportionally.

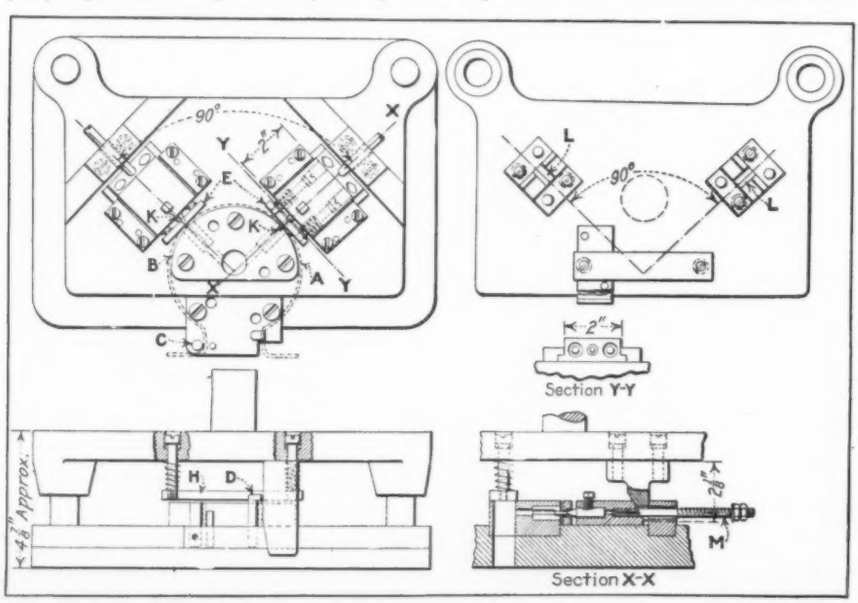
To facilitate the work and to avoid the need of drawing these parallel lines, a large sheet of heavy drawing paper is laid out with a series of parallel lines, closely spaced, and in ink for permanency. These lines may be made at random and of different colors for quick identification, or better yet, they may be laid out and labeled to some definite scale, as, for example, sixteenths of an inch. This sheet should be carefully made, since it may be used over and over whenever the need arises. This sheet is then slipped under the tracing paper as illustrated, and any length lifted from the first drawing by dividers or rule and placed on line *AB*, may be automatically picked off from line *AC* in terms of the scale of the second drawing, by merely following it across by eye along the corresponding or nearest parallel line. This method is both rapid and inexpensive and there is no necessity of actually laying out one of the drawings all over again.

Side-Action Piercing Tools

By Louis L. Locke

Piercing tools of the side-action type, used for perforating two ⅛-in. holes in a steel band, are shown in the illustration. The material to be pierced is ⅛ in. in thickness, ⅞ in. in width, and the holes are spaced 90 deg. apart. The band, which has previously been formed to the shape indicated at *A*, is located over the die block *B* so that one end fits around the pin *C*. The finger *D* locates the opposite end of the bracket and holds it down in place. To insure having the work seat properly against the die block, the stripping plates *E* strike the work on the downward stroke of the punch holder, prior to the action of the piercing punches. Another precaution taken in the locating of the work, is to hold it down properly, this being done by the pressure pad *H*. With this method of holding and locating, there is little chance for the work to become misaligned.

The piercing punches *K* are mounted in slides that receive horizontal movement from the angular blocks *L* attached to the punch holder. The sectional view at *X-X* shows constructional details of the slides and the punches. When the ram rises, the slides are withdrawn from the work by the helical springs and the studs as shown at *M*. At *Y-Y* is shown the method of mounting the slides to the die block.



Piercing tools with sliding punches

Reducing the Breakage of Hammer Handles—*Discussion*

By R. B. Smith

Principal, International Correspondence Schools

In an article by Richard H. Kiddle, under the title given above, published on page 69, Vol. 67, of the *American Machinist*, the author does not state the purpose for which the hammers mentioned were used. However, from the illustration it would appear they were of the ordinary ball-peen type used by machinists, and this supposition is the basis for the following discussion:

Hammer handles are generally broken because a fair blow is not struck. That is, because the blow is taken on the edge of the hammer face, rather than flat on that face. The effect of such a blow is to set up a severe twist in the handle, due to the inertia of the hammer head. This effect may be heightened by grasping the handle of the hammer too firmly, so as to form a fairly rigid connection between the hand and the hammer head.

A man experienced in the use of such a hammer grasps the handle lightly, so that the shock of the blow is not carried into the arm, and he aims to strike a fair blow so that the full weight of the hammer is effective at the instant of contact. When used in this way, a more or less springy handle is a valuable asset, and it is not uncommon to find that mechanics file or scrape the handles of their hammers until they are so thin as to be unable in themselves to support the force of the blow if rigidly struck.

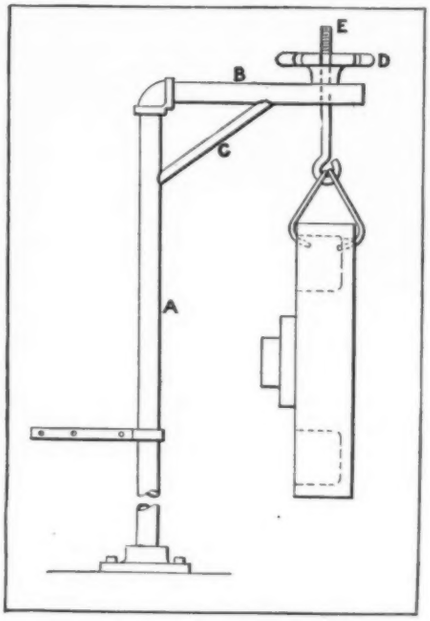
In the hands of an inexperienced user, a heavy, rigid hammer-handle may have a longer life than the more refined handle would permit, but from Mr. Kiddle's description it would appear that the insertion of a metal strip would defeat to a large extent the purpose of shaping the handle. Assuming that working conditions are right, and that hammers in question are not called upon to perform work for which they are not fitted, would it not be more to the point to find which men on the force are responsible for the breaking of hammer handles, and to give them a few minutes instruction in the proper use of the hammer? Such a course of procedure would not only emphasize in the worker's mind the importance of saving his hammer handle and using the hammer in the most efficient way, but would also increase production in so far as it would enable him to strike a more efficient blow, and, therefore, accomplish his purpose with fewer blows.

Device for Removing Lathe Chucks
Discussion

By H. K. Pinkerton

In an article under the title given above, on page 200, Vol. 67, of the *American Machinist*, J. H. Hahn describes a device for handling lathe chucks that seems to me to be more complicated and costly than is necessary.

The device here shown has been made standard equipment in the shop of the Kansas State Agricultural College, Manhattan, Kan., for all lathes having chucks heavier than can be handled by one man. The member *A* is a piece of 2-in. pipe. Its lower end rests on the floor and is set loosely in a floor flange. A strap of iron bent to fit the pipe and fastened to the headstock of the lathe, supports the pipe in a vertical position. Member *B* is screwed into an elbow at the top of the vertical pipe, and the brace *C* is welded to both members. The handwheel *D* is tapped to fit the eyebolt *E*, from which two clip hooks for holding the chuck are suspended. By turning the handwheel in the proper direction, the chuck can be raised or lowered to bring it in line with the lathe spindle or to hold it in position while it is being put on or taken off of the spindle. When the chuck is free from the spindle, it can be swung out of the way by revolving the crane.



Crane for handling lathe chucks

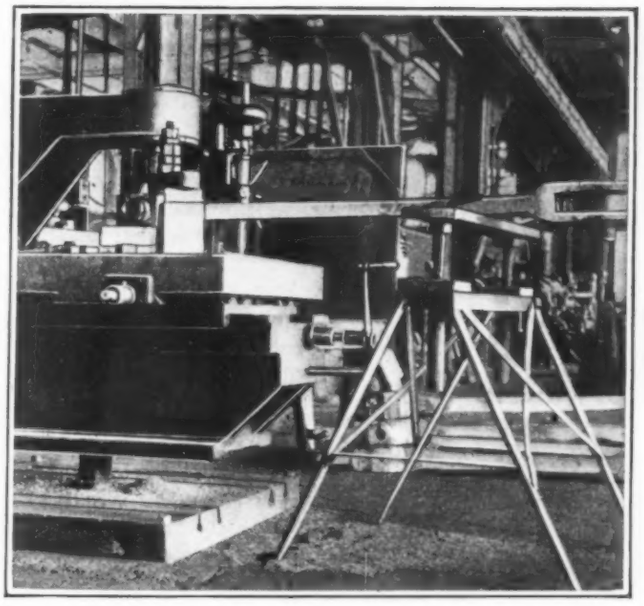
By placing a second such crane about six inches from the first one, and making it high enough so that the jib will clear that of the first one, the large faceplate and the chuck can both be handled.

Adjustable Horse for Supporting Work

By P. A. Jones

The illustration shows a convenient horse for supporting the overhanging end of heavy work while being machined in a shaper or drill press. The horse is made from flats and channels. Its principal feature is a crossbar that can be raised or lowered by screws at each end. The screws are 1½ in. in diameter and are threaded almost the whole length. Instead of collars on the screws for supporting the cross bar, nuts are placed in the proper position on the screws and are either pinned or welded in place. Holes in the projecting ends of the screws, permit the use of bars for turning them.

Cotter pins through the lower ends of the screws prevent them from being run out of their nuts. The parts of the screws projecting below the stationary cross-bar are protected by casings made from pieces of pipe.



Convenient horse for supporting and leveling work

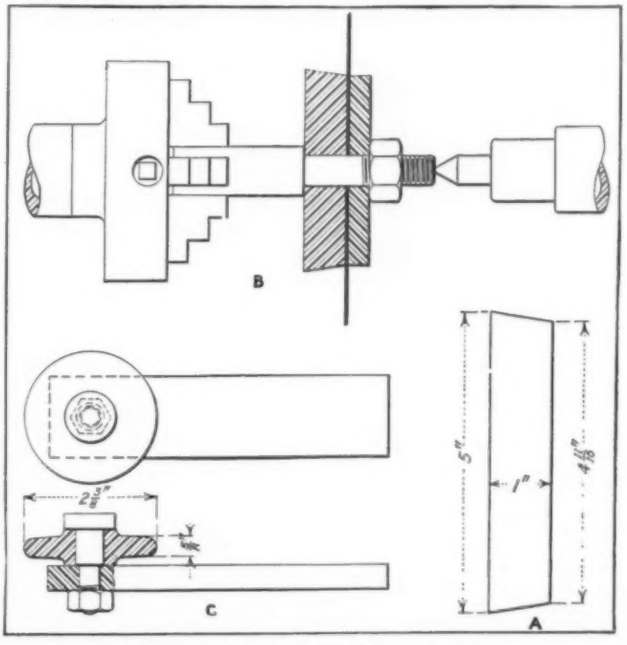
The job shown in the illustration is a locomotive side-rod in which the bushing is being bored in a Baker vertical boring machine. The work must be accurately leveled, and for this purpose such a horse as the one described is much superior to the usual method of blocking up the work.

Spinning Copper Cups

By E. J. Jordan

Some time ago we received an order for several hundred cups to be made as at *A* in the sketch, from 0.038-in. unannealed sheet copper.

Since none of us had had any experience with this class of work, the job had us guessing for awhile. However, we decided that it would be better to try to spin the cups rather than to press them.



The tools used in spinning the cups

We made a cast-iron form of the same size as the inside of the cup, and mounted it on a threaded mandrel having a collar and a nut, as shown at *B*. The copper, cut into a disk $6\frac{5}{8}$ in. in diameter and having a $1\frac{3}{4}$-in. hole was placed between the form and the washer, as shown. With the whole affair mounted in the lathe and running at high speed, we tried to spin the cup with a tool having a spherical point. While we succeeded in spinning a cup, its surface was far from smooth and the reduction in the thickness of the metal was considerable.

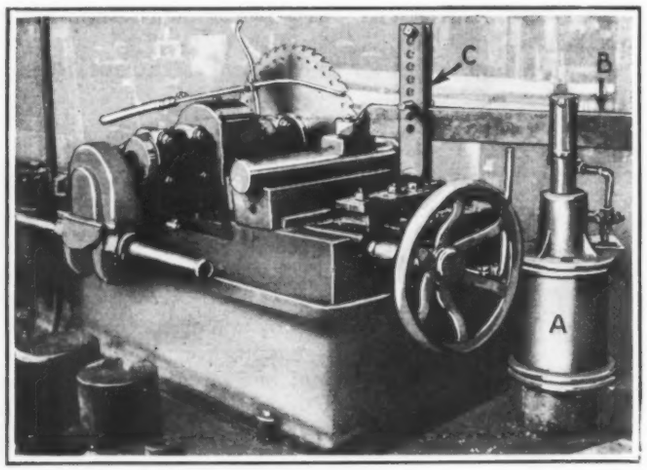
Finally we tried a roller tool, as shown at *C*, held in the toolpost. Using oil as a lubricant, the cup was nearly completed by manipulating the compound rest by hand. For the completion of the cup, the taper attachment was used, being set to the angle of the cup wall. The cup was given a very smooth finish, and the reduction in the thickness of the metal was but a few thousandths.

Air Clamp on a Cold Saw

By W. F. Stewart

The illustration shows a cold saw equipped with an air-operated clamp in place of the usual clamp manipulated by a screw.

In operation, air admitted to the cylinder *A* forces up the piston and the end of the lever *B* connected to the



Cold saw equipped with an air clamp

piston rod. Since the lever is fulcrumed by a pin on the upright *C*, the end carrying the clamp pad is forced downward, causing it to hold the work tightly.

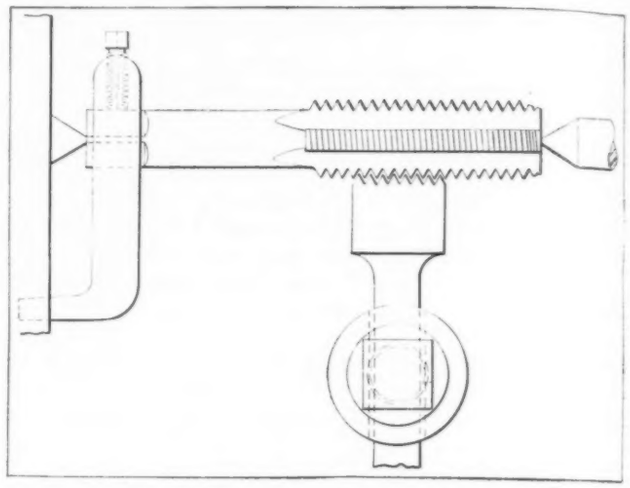
The clamp can be adjusted for bars of various diameters by moving this fulcrum pin into one of the holes in the upright *C* to suit the work. The air valve is placed so as to be convenient for the operator.

Simple Way to Make a Thread Chaser
Discussion

By C. G. Williams

I have noted how S. A. Burbey, writing on page 791, Vol. 66, of the *American Machinist*, would make a thread chaser. While one can be made in that way if enough time is spent upon it, the older machinists know by experience that a chaser that will do quite as good work can be made quickly in the following manner:

Take a new tap of the required pitch—no matter about



Making a chaser with a tap

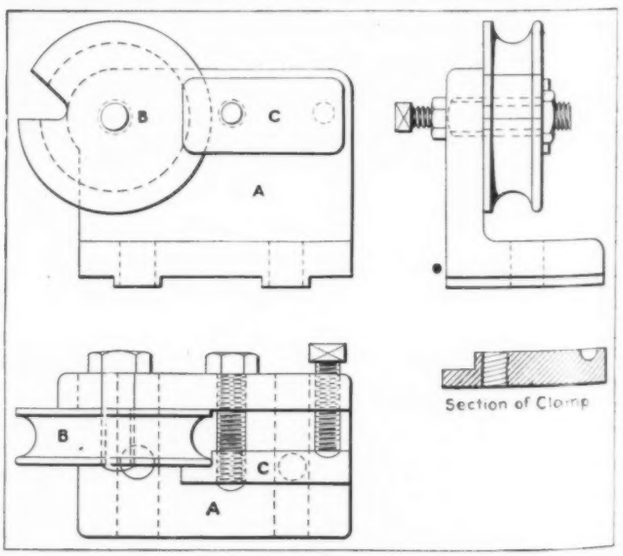
the diameter—place it on centers in a lathe with a dog on the squared end to drive it, and place the chaser blank in the tool post at an angle to give a rake of about 8 deg. to the teeth. Gear the lathe to cut the same pitch of thread as the tap, and pass the blank back and forth over the tap as if cutting a thread.

A chaser can be made by this method in one-quarter of the time required by any other process, and it will be smoother and will need no hand work after it has been hardened.

Holder for Form Tool

By E. Caudle

A cheaply constructed holder for form tools is shown in the accompanying sketch. It consists of the cast-iron bracket *A* having tongues to fit the slots in the cross-slide toolblock, and the clamp *C*. The tool *B* is mounted in



Simple holder for form tools

the usual manner by a screw, and is rigidly held by the clamp, which is adjustable for tools of different thickness.

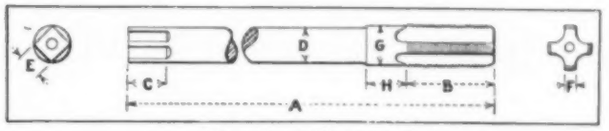
The step on the clamp can be omitted where there is ample room for the swing of the turret tools. While the sketch shows the tool and clamp on the inner side of the upright member of the bracket, they can be placed on the outside if desired.

Standard Tap Dimensions

(Continued from sheet 12)

These specifications are set up as applying to 4-flute taps only, except on the machine screw sizes No. 0 to No. 6, inclusive, and cut-thread tapper taps $\frac{1}{4}$ to $\frac{5}{8}$ in., inclusive, which have 3 flutes. It has been found that taps usually will produce a threaded hole slightly larger than the tap when used under normal conditions.

Ground-thread taps made in accordance with these specifications will produce, in the majority of cases, American (National) Standard Class 3 threaded holes, and in all cases Class 2 threaded holes. Cut-thread taps made in accordance with these specifications will produce, in all cases, American (National) Class 2 threaded holes, and are recommended for use where lead and form are not so important.



Standard Tapper Tap

Where tapper taps $\frac{3}{4}$ in. and larger are used, it may appear that a 3-flute tap is required, but a little care in setting up the job will usually prove that a 4-flute tap is satisfactory.

(Continued on sheet 12b)

Dimensions for Tapper Taps with Ground Threads

Size	Pitch Diameter			Major Diameter			General Dimensions						
	Basic	Min.	Max.	Basic	Min.	Max.	Thread Length B	Square Length C	Shank Dia. D	Square Size E	Land Width F	Pilot Dia. G	Pilot Length H
1/4-20	.2175	.2180	.2185	.2500	.2535	.2550	1 1/4	3/8	.185	.139	.065		
1/4-28	.2268	.2273	.2278	.2500	.2520	.2535	1	3/8	.185	.139	.065	.2035	1/4
5/16-18	.2764	.2769	.2774	.3125	.3165	.3180	1 3/16	5/16	.240	.180	.081		
5/16-24	.2854	.2859	.2864	.3125	.3150	.3165	1 1/16	5/16	.240	.180	.081	.2585	1/4
3/8-16	.3344	.3349	.3354	.3750	.3795	.3810	1 7/16	11/32	.294	.220	.097		
3/8-24	.3479	.3484	.3489	.3750	.3775	.3790	1 1/16	11/32	.294	.220	.097	.3210	5/16
7/16-14	.3911	.3916	.3921	.4375	.4425	.4440	1 11/16	3/8	.345	.259	.114		
7/16-20	.4050	.4055	.4060	.4375	.4410	.4425	1 5/16	3/8	.345	.259	.114	.3725	1/4
1/2-13	.4500	.4505	.4510	.5000	.5055	.5070	1 3/16	3/8	.400	.300	.130		
1/2-20	.4675	.4680	.4685	.5000	.5035	.5050	1 3/16	3/8	.400	.300	.130	.4350	1/4
9/16-12	.5084	.5089	.5094	.5625	.5685	.5700	2 1/16	3/8	.450	.337	.146		
9/16-18	.5264	.5269	.5274	.5625	.5665	.5680	1 1/16	3/8	.450	.337	.146	.4905	5/16
5/8-11	.5660	.5665	.5676	.6250	.6315	.6330	2 1/16	13/32	.503	.377	.162		
5/8-18	.5889	.5894	.5902	.6250	.6290	.6305	1 11/16	13/32	.503	.377	.162	.5530	5/16
3/4-10	.6850	.6855	.6866	.7500	.7570	.7590	2 1/16	1	.616	.462	.194		
3/4-16	.7094	.7099	.7107	.7500	.7540	.7560	1 3/16	1	.616	.462	.194	.6690	3/4
7/8- 9	.8028	.8038	.8050	.8750	.8830	.8850	2 3/16	1 1/16	.727	.545	.212		
7/8-14	.8286	.8296	.8305	.8750	.8795	.8815	1 7/16	1 1/16	.727	.545	.212	.7820	3/8
1 - 8	.9188	.9198	.9212	1.0000	1.0090	1.0110	3 1/16	1 5/16	.834	.625	.242		
1 -14	.9536	.9546	.9555	1.0000	1.0045	1.0065	2 1/16	1 5/16	.834	.625	.242	.9070	1
1 1/8- 7	1.0322	1.0332	1.0347	1.1250	1.1345	1.1370	3 1/16	1 1/16	.933	.700	.....		
1 1/8-12	1.0709	1.0719	1.0729	1.1250	1.1300	1.1325	2 3/16	1 1/16	.933	.700	.....	1.0170	1 1/16
1 1/4- 7	1.1572	1.1582	1.1597	1.2500	1.2595	1.2620	3 1/16	1 1/16	1.058	.793	.....		
1 1/4-12	1.1959	1.1969	1.1979	1.2500	1.2550	1.2575	2 3/16	1 1/16	1.058	.793	.....	1.1420	1 1/16
1 3/8- 6	1.3917	1.3927	1.3945	1.5000	1.5115	1.5140	4	1 1/2	1.278	.958	.....		
1 3/8-12	1.4459	1.4469	1.4479	1.5000	1.5050	1.5075	2 5/16	1 1/2	1.278	.958	.....	1.3920	1 3/16

Dimensions for Tapper Taps with Cut Threads

Size	Pitch Diameter			Major Diameter			General Dimensions						
	Basic	Min.	Max.	Basic	Min.	Max.	Thread Length B	Square Length C	Shank Dia. D	Square Size E	Land Width F	Pilot Dia. G	Pilot Length H
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1/4-28	.2268	.2273	.2288	.2500	.2525	.2550	1	3/8	.185	.139	.....	.2035	1/4
5/16-18	.2764	.2769	.2789	.3125	.3155	.3180	1 3/16	5/16	.240	.180	.....		
5/16-24	.2854	.2859	.2874	.3125	.3155	.3180	1 1/16	5/16	.240	.180	.....	.2585	1/4
3/8-16	.3344	.3349	.3369	.3750	.3785	.3810	1 7/16	11/32	.294	.220	.....		
3/8-24	.3479	.3484	.3499	.3750	.3785	.3810	1 1/16	11/32	.294	.220	.....	.3210	5/16
7/16-14	.3911	.3916	.3941	.4375	.4410	.4440	1 11/16	3/8	.345	.259	.....		
7/16-20	.4050	.4055	.4075	.4375	.4410	.4440	1 5/16	3/8	.345	.259	.....	.3725	1/4
1/2-13	.4500	.4505	.4530	.5000	.5040	.5070	1 3/16	3/8	.400	.300	.....		
1/2-20	.4675	.4680	.4700	.5000	.5040	.5070	1 3/16	3/8	.400	.300	.....	.4350	1/4
9/16-12	.5084	.5089	.5114	.5625	.5670	.5700	2 1/16	3/8	.450	.337	.....		
9/16-18	.5264	.5269	.5289	.5625	.5670	.5700	1 1/16	3/8	.450	.337	.....	.4905	5/16
5/8-11	.5660	.5665	.5690	.6250	.6300	.6330	2 1/16	13/32	.503	.377	.....		
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3/4-16	.7094	.7099	.7124	.7500	.7550	.7590	1 3/16	1	.616	.462	.194	.6690	3/4
7/8- 9	.8028	.8038	.8068	.8750	.8805	.8845	2 3/16	1 1/16	.727	.545	.212		
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1 - 8	.9188	.9198	.9228	1.0000	1.0060	1.0100	3 1/16	1 5/16	.834	.625	.242		
1 -14	.9536	.9546	.9571	1.0000	1.0060	1.0100	2 1/16	1 5/16	.834	.625	.242	.9070	1
1 1/8- 7	1.0322	1.0332	1.0367	1.1250	1.1310	1.1355	3 1/16	1 1/16	.933	.700	.....		
1 1/8-12	1.0709	1.0719	1.0749	1.1250	1.1310	1.1355	2 3/16	1 1/16	.933	.700	.....	1.0170	1 1/16
1 1/4- 7	1.1572	1.1582	1.1617	1.2500	1.2565	1.2610	3 1/16	1 1/16	1.058	.793	.....		
1 1/4-12	1.1959	1.1969	1.1999	1.2500	1.2565	1.2610	2 3/16	1 1/16	1.058	.793	.....	1.1420	1 1/16
1 3/8- 6	1.3917	1.3927	1.3962	1.5000	1.5075	1.5120	4	1 1/2	1.278	.958	.....		
1 3/8-12	1.4459	1.4469	1.4499	1.5000	1.5075	1.5120	2 5/16	1 1/2	1.278	.958	.....	1.3920	1 3/16

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Technical Abstracts

New Heat-Treating Furnaces for Capscrews

The Victor-Peninsular Co., Detroit, manufacturers of high quality capscrews for motor car builders, has now re-equipped its heat-treating department with a number of automatic continuous furnaces which are securing a product of improved quality and uniformity and at a more rapid rate.

In the previous method the practice was to purchase cold-drawn hexagonal bars of S.A.E. 1112 steel and to turn the head, shank and thread down to finished dimensions on automatic machines. Screws made by this method gave a yield point of 65,000 lb. per sq.in., a figure considered sufficient at the time, but the expense of milling from a bar, where the average material waste exceeded 50 per cent, met with objection from an economic standpoint. The next step, therefore, was to cold-head, cold-drawn bolt wire, by which method the average waste became less than 15 per cent, but the yield point of S.A.E. 1010 steel used, of only 45,000 lb. per sq.in., was considered too low, and after many researches a material, comparable to S.A.E. 1035 steel, was finally selected; it is now designated as V.P. 30-37 steel and has the following composition in percentage: Carbon 0.30-0.37; Manganese 0.65-0.85; Phosphorus under 0.04; Sulphur under 0.045.

After proper heat-treatment, the following physical properties were obtained: Yield point 70,000-100,000 lb. per sq.in.; ultimate strength 95,000-120,000 lb. per sq.in.; minimum elongation 17 per cent; minimum reduction of area 50 per cent; Brinell hardness 196-241; Shore hardness 30-40.

The rotary oil furnaces formerly used have been replaced by seven automatic continuous gas-fired furnaces of the moving-hearth type designed and built in the plant. Three of the furnaces are used for heating operations and four for tempering.

The furnace is approximately 15 ft. long, 42 in. wide and 30 in. high. The heating chamber is 7½ in. high, 22 in. wide from wall to wall, including the flue ports, and the hearth is 12 ft. long. The burners are below the hearth level, the heat passing under, then up and over the conveyor belt. Each hardening furnace is equipped with 16 burners and each tempering furnace with 12. They burn city gas.

The conveyor belt is made from No. 16 or 18-gage stainless iron containing 0.08 per cent carbon; its loading space is 10¼ in. The belt is looped over two 18-in. standard pressed steel pulleys about 24 ft. apart and the two ends are riveted together with stainless metal rivets. A belt tightening device with a counterbalance has been provided.

The belt rests directly on the hearth and is moved by a small motor mounted on top of the furnace. The same motor also operates the conveyor belts used in the quenching tanks.

Each furnace is provided with a loading table about 8 ft. long, over which the conveyor belt travels before it passes into the heating chambers. The work comes from the inspection bench in the upsetting shop to the furnaces on a roller conveyor. A scale in the conveyor counts the screws prior to heat-treatment. Along each side of the belt is a bin in which the screws are dumped from the metal containers. One operator loads two furnaces; with a small shovel he distributes the work in a single layer on the conveyor.

From 12 to 16 minutes is required for the work to pass through the heating chamber and with the work evenly distributed on the belt, the screws are exposed and uniformly heated to a temperature of about 1,550 deg. F. As the belt emerges from the heating chamber and passes over the pulley, the screws plunge off into the quenching tank. Passing through the quenching solution, the screws drop upon a 20-in. special conveyor belt fabricated from No. 16 gage, 3-16-in. mesh, wire fence. The belt is driven through a combination chain and belt drive.

With the two oil-quenching furnaces, used for alloy steel and the smaller carbon steel screws, the work passes up the inclined belt permitting the oil to drain through, then drops into metal boxes at the ends of the tanks. In the water-quenching furnace, used for ⅜-in. and larger carbon steel screws, these are carried from the water and drop into the tank of soluble oil and, dropping upon a second conveyor, pass up to the unloading station. One man unloads four furnaces, placing empty boxes and removing the loaded ones.

From the hardening furnaces, the work is taken to the drawing or tempering furnaces which are similar in design except that they have fewer burners and are equipped with single quenching tanks. The carbon steel capscrews are drawn at temperatures necessary to give a Brinell hardness of 196 to 243 according to specifications. Alloy and special screws are drawn to hardness desired or specified. From the tempering heat the work is quenched into a special soluble oil, as it is desired to cool the product quickly and to obtain a smooth, glossy, rust retarding black finish. The screws are free from loose scale and have clean threads.

All furnaces are equipped with automatic temperature control which operates within limits of plus or minus 5 degrees.—E. F. Ross, *Iron Trade Review*, Sept. 8.

Where Is This Machine Age Taking Us

In the first of three articles it is pointed out that machine industry is the background of every modern enterprise. It dominates both the social order and the business order. The business man must know the character and tendency of machine industry if he is to conduct his affairs successfully.

Critics of machine civilization hold the following twelve things against it:

That it is uncontrollable by man.

That it destroys natural beauty and natural wealth.

That it robs the world of local color and character and heads humanity straight for a strict uniformity.

That it hampers the mobility of the local citizen by taking his means of transportation from his control.

That it destroys the great race of skilled craftsmen, which leads to concentration in great centers.

That it tends to decrease the producing class and to increase the number of non-producers.

That it makes commodities for sale rather than for use.

That it breeds class antagonisms.

That it encourages wastefulness in the rank and file of the people.

That it degrades the taste of the rank and file.

That it creates citizens that lack a sustained interest in the good management of their government.

That it transforms man from self-helpfulness to self-helplessness.—Glenn Frank in *The Magazine of Business* for September.

Brass Cutting Tools

Certain metals are springy and tough, and tend to form chips of a spiral shape. In this class fall wrought iron, steel, copper, and unleaded brass mixtures. Other metals, such as cast iron, and leaded or free-cutting brass, produce chips which tend to break off short. It has been found that tools designed to cut metals of one of these groups will not cut metals of the other group with equal satisfaction.

Experience shows that the best form of tool or die for cutting copper is one which has a rake or hook. The effect of rake is to help to bend the chip into its spiral form as it is cut from the work. The question of the proper angle of rake for various materials is one on which there is much difference of opinion. But it seems well established that copper requires a greater rake than steel or wrought iron. But it is found that if tools with a rake or hook are used for cutting leaded brass, there is a distinct tendency for the tools to dig into and tear the metal. The form

which gives best results is one with little or no rake. This shape of tool does not dig into the brass, but makes the chips turn a sharp angle as they come off and breaks them up.

Although a good sharp die of proper form will cut a satisfactory thread on brass pipe, the life of the die will be increased by the use of a cutting oil. A good grade of lard oil, with perhaps a little white lead added, is recommended. A good cutting oil for copper alloys may be made as follows: Lard oil, 2 quarts; soluble cutting compound, 1 pint; water, ½ pint; and turpentine, ½ pint. It is also important that dies for cutting brass pipe be kept sharp. At times it will be found that tools which cut good threads will tear them when being backed off. The remedy for this is to grind or file off the backing-off face until any imperfection on the backing-off edge is removed.—*Brass Tacks,* Sept., 1927.

Standard Gaging Temperature

From the point of view of international standardization it is important to come to an agreement as to the value of the standard gaging temperature which unfortunately at present remains unsettled, although it is generally taken to be either 0 deg. C. (32 deg. F.) or 20 deg. C. (68 deg. F.).

It seems that both values (0 or 20 deg. C.) have their respective merits, but after many years of indecision it is high time that one or the other should prevail. It might be said that in France the value of 0 deg. C. is generally (although not always) favored, while in Germany and in most of the other European metric countries the 20 deg. C. standard prevails and seems to be gaining in popularity.

It is important to note that if a 0 deg. C. standard is adopted, the fixation of a standard value for the temperature expansion coefficient of the gage-material is of prime importance, as the actual measures will be taken at room temperatures and then reduced to the temperature of melting ice, while with the 20 deg. C. standard the measurements may be actually done at the standard temperature and then no temperature reduction is necessary, no matter what material or materials the gage is made of.

With a 20 deg. C. standard the following considerations would apply. The temperature of 20 deg. C. (68 deg. F.), as measured by a standard hydrogen thermometer is recognized to be the standard gaging temperature at which the nominal values (inscribed on the gage) and the actual values (measured by the gage) correspond exactly.

The gages are not required to have any special standard value for their coefficient of thermal expansion.

The actual measurements should be done as nearly as possible to the standard temperature. If in addition to that the coefficient of thermal expansion of the gage (which should be known) and of the article measured are nearly the same, the highest degree of precision is attainable.

The nearness of temperatures is the more important in cases where the tolerances are small and when the materials of the gage and of the article to be measured have greatly different coefficients of thermal expansion.

If a 0 deg. C. standard is adopted, a theoretical value for the coefficient of a standard gage expansion (not necessarily equal to the actual coefficient of the gage's thermal expansion) should be internationally agreed upon. If, for example, this coefficient is taken to be 10.7×10^{6} per degree centigrade (which would correspond to the French standard known as S.T.A. from the words "Section Technique de l'Artillerie") then at the reference temperature of 20 deg. C. the nominal value read on the the gage should be increased by 214 millionths to give the theoretical value.

Under these conditions a gage corresponding to its theoretical value at the reference temperature, and having the theoretical coefficient of thermal expansion, will at 0 deg. C exactly have its nominal value.

All other considerations are the same as for the case previously treated.

Unless some agreement is eventually reached among the various metric countries it must be borne in mind that there really doesn't exist such a thing as a unique metric standard. At best there are at present two such standards.—*Le Genie Civil,* Sept. 10.

Aircraft and Automobile Industries are Natural Allies

Although it has been generally understood that the aircraft activities of the Ford organization were largely experimental, it is also stated that a small plane is being considered as a quantity production proposition at the Dearborn Airplane Plant, which seems to place this organization definitely in the airplane field. According to William Mayo, engineer of the Ford Motor Co., and also directly connected with several different aviation activities, the aircraft and automobile industries are very closely allied.

"Not only could the aeronautical industry never have reached its present stage of development in so short a time, without the active assistance of, and knowledge gained from the automobile industry, but it has much to gain from a tie-up with the automotive industry in future, not only as regards engineering design, but also in merchandising, service and operating methods. The airplane in reality is nothing but an automotive vehicle of slightly different form. It has gas tanks and gas lines, rubber tires and wire wheels, brakes and ball bearings. Even in the design of passenger accommodation, the trend is following that of the automobile. In the early days open cockpit type machines were almost universally used, as were open models in the passenger car field. Now the public has come to demand closed cabin ships for airplanes, and closed models in automobiles.

"As far as structure of the airplane proper goes, materials used in all metal planes have to go through similar manipulation to those in automobile bodies. Streamline and airfoil sections are getting to be more and more standardized, making the problem of airplane building one of production rather than of aerodynamic design. Even the instruments used in airplanes are similar to those used in automobiles.

"An automobile dealer organization would not need separate sales forces to sell the smaller planes. The average automobile salesman of today is fully capable of handling such sales. When public demand makes advisable the retail handling of airplanes through dealer organizations, more planes will be handled through their regular dealers. The Lincoln dealer in Los Angeles already has a plane which he is using as a demonstrator. This applies mainly to the smaller types of plane, adaptable to individual ownership and operation. Larger transport ships will probably continue to be handled directly from the factory." Although aeronautics is considered as a young man's game, Mr. Mayo is over sixty, and is an ardent enthusiast of aviation, having flown many thousand miles, covering the larger part of the United States.—A. F. Denham, *Automotive Industries,* Sept. 24.

Maintaining and Increasing Profits

No matter how efficient the management of an enterprise may be it is powerless to control the business tide and can do no more than exploit the opportunities of prosperity and minimize the effects of depression. Improved conditions that are evident to everybody have taken some of the uncertainty out of business but have made the individual's problem harder by increasing his competition.

Making the adjustments necessary to cope with outside conditions is an executive function but the observations on which the adjustment depend can best be made by experts.

Careful analysis of conditions would permit corporations that must carry heavy raw material inventories to anticipate periods of falling prices and tight money. It would also reduce excessive expense caused by labor turnover and the payment of premiums in boom times. And it could do much to improve the budget that is based on guesses and hopes.

Profits may be increased through anticipation and measuring of the purchasing power and demand of the country, as has been done by General Motors which has been so successful in adjusting its production schedules to sales requirements. Insurance companies are learning that their business is affected by the ups and downs of general business and are acting acordingly. The American Radiator Company has found out how to anticipate the fluctuations in the pig iron market.

Business has reached a stage where profits of any magnitude can no longer be made in spite of loose-jointed management.—G. M. Whitright in *The Management Review* for September.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

The Machine Tool Industry Must Go Forward

THIS has been a year of remarkable achievements. And, so far as industry is concerned, none has been more striking than the exposition of machine tools at Cleveland last month. Never before has there been such a collection of worth-while developments in the master tools of industry as were there displayed.

Much good should come out of this exposition, entirely aside from the mechanical achievements there exhibited, many of them for the first time. The builders of machine tools have demonstrated their ability to display their own products and to secure an attendance of machine-using executives that was even beyond their expectations. They have impressed the users of machine tools, as never before, with the extent and the solidarity of the machine tool industry. They grasped the opportunity to show the strength and the dignity of the industry in a way that impressed every user who was fortunate enough to visit the exposition.

Every member of the industry should remember the new dignity and prestige that it has acquired. There should be no slipping back into an attitude of inferiority in any respect. Business should be taken only on an equitable basis, which means that it should be profitable enough to permit further development and periodic replacement of equipment. A recollection of the Cleveland exposition should be sufficient tonic to brace any backbone that might show signs of wavering.

Promoting the Adoption of Standards

IT IS hard to understand where certain standards enthusiasts get the idea that when a new standard has been formulated there is nothing left to do but sit back and accept the plaudits of grateful manufacturers. It would be just as reasonable for the manufacturer to dispense with his selling organization, build a good product and then rest with a clear conscience while the consumers fell over each other trying to take it away. Consumers don't act that way, as a rule.

The parallel of the standards body and the manufacturing organization is not an improbable one, for such a standards body as the Standards Committee of the Society of Automotive Engineers is engaged essentially in manufacturing standards. It has just as much difficulty in selling its product to the customers to whom it caters as does a manufacturer in disposing of his wares, but with far less reason.

Partly to bring its standards more forcibly to the attention of the manufacturer, and partly to insure that the standards are really up-to-date and useful, the S.A.E. has undertaken a systematic survey to determine the extent to which its established standards are in use and also what is wrong with those that have failed of general acceptance.

Ten standards have been so treated. Some of them have had flatteringly large acceptance. Others have hardly made their existence felt. Two, at least, have shown no need for revision. Others are under consideration by the divisions interested. The success of the plan is apparently such that other standardizing bodies could well adopt it.

How Book Depreciation Robs Production

DEPRECIATION and obsolescence are too often used merely to put something over on the tax-collector. Ten or fifteen per cent of the purchase price of shop equipment is written off the books each year, but how often does this amount go into a reserve fund to be used in replacing the equipment when necessary?

Unless the amount of depreciation does go into such a fund, the productive division of the plant has been robbed of its future capacity to produce at an economical figure. If the money that should have gone to this reserve fund is used to pay dividends, it is plainly to be seen that they have not been earned and that the concern has weakened its position in a competitive market.

Up-to-date equipment is absolutely necessary if any concern is going to stay in business over an extended period. Failure to provide for replacing inefficient equipment has been the downfall of many firms that were supposed to be prosperous.

Management that does not provide for a reserve equal to the actual depreciation in equipment value is flirting with disaster. No business is really profitable that has not tucked away enough available reserve to keep its equipment thoroughly efficient.

Book reserves for depreciation mean little unless there is cash available to make good on productive capacity.

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Sundstrand Automatic Lath

BEFORE this automatic lathe was designed by the Sundstrand Machine Tool Co., Rockford, Ill., a study was made of the machine requirements for producing about four hundred parts in common use in various fields. In this way the maximum and minimum spindle speeds, the limits of feed of the front carriage and of travel of the rear tool, and the maximum and minimum center distance were determined and the lathe designed to suit these conditions. The construction of the machine is based on the principle of giving maximum feed. The headstock and bed are an integral unit for rigidity and the rear carriage is designed to be practically integral with both, yet is adjustable along the ways. The entire machine is substantially constructed with a minimum of floor space.

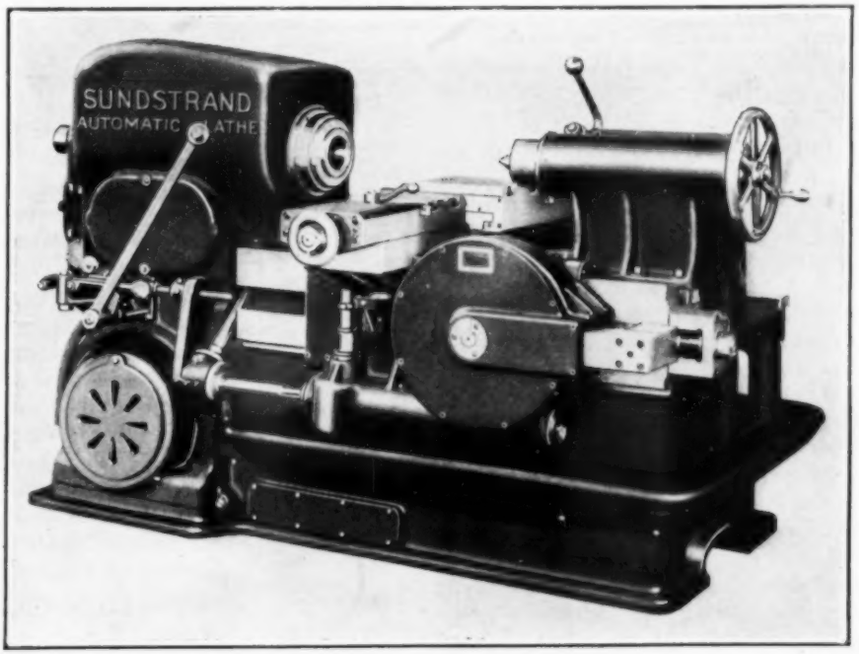
The lathe may be driven direct from a lineshaft or by motor. In the latter case the motor is placed in the base completely inclosed and drives to the clutch by means of a silent chain. On the main drive pulley is mounted a twin-disk clutch of ample size to transmit 30 hp., approximately twice the power necessary for the heaviest cuts within the capacity of the machine. Pick-off gears are used to transmit the power from the clutch to the main drive shaft, one gear being mounted on the main drive shaft and one on the worm. The final drive to the spindle is by means of a worm and wheel. The worm is made of alloy steel, hardened, ground and polished, and the wormwheel is made from high-grade gear bronze, chilled when cast. The wormwheel is mounted directly on the main spindle. Thus in addition to the worm and wormwheel only two gears are used to obtain the drive to the spindle.

The spindle is made of 0.60-carbon steel, heat-treated, and is unusually large to eliminate vibration. It runs in adjustable taper bronze bearings, both front and rear, with a large ball thrust bearing mounted between the flange on the spindle nose and the headstock. Close adjustment is provided to insure the thrust being taken at all times by the thrust bearing. The spindle construction permits the use of any type of air-operated chucking device and with the adjustment provided for the bronze taper bearing, permits the use of an air-operated device on the tail stock without exceeding the thrust capacity of the thrust bearing.

The feed box is simple in construction, having one clutch, driven directly from the main spindle, for the feed and two clutches for the rapid approach and reverse. One gear is mounted directly on the main spindle and meshes with the gear on the pick-off gear shaft. The power is then transmitted by means of pick-off gears between this shaft and directly to the one-way positive clutch on the center shaft. The rapid approach clutch and the reverse clutch are driven directly from a sprocket on the main drive pulley and run at a constant speed giving the rapid approach and reverse of front and rear carriage, a travel of approximately 70 in. per minute. The clutches mentioned are of the multiple-disk type running in oil and provided with facilities for adjustment. The power is transmitted from the rapid approach clutch and the reverse clutch direct to the center shaft by means of bevel gears and the control of all three clutches is such that under no conditions can two clutches be engaged simultaneously.

The front carriage is 28 in. long providing ample bearing area. It is fed longitudinally by two cams, one on each side of the wormwheel used to drive them. Each of the cams is engaged with a roller, the roller being mounted on anti-friction bearings on a roller slide secured in the headstock. One of the cams feeds the carriage 3½ in., and when the wormwheel has been traveled half a revolution, the cam on the other side of the wormwheel engages its roller simultaneously as the first cam disengages and feeds the carriage another 3½ in. This arrangement permits a longitudinal feed of 7 in. If less than 3½ in. feed is required for the work, one of the rollers is disengaged and only one cam used.

To transmit power to the carriage, a worm and wormwheel drive is used. The worm is mounted directly in the carriage itself and obtains its motion from a rear shaft driven directly from the center shaft, as in the feed box construction. This arrangement permits the tool to be fed to a shoulder and keep within limits of 0.0005 and 0.001 in. It also allows the carriage



Sundstrand Automatic Lathe

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to be stationary for a quarter of a revolution either at a starting point or a stopping point. Thus, the cross-slide can be fed into the required depth, or a facing cut can be taken, if necessary, before the longitudinal feed starts. It also allows the reversal of the cross-slide and the carriage simultaneously, giving a triangular movement of the cutting tool. Any combination of movement between the carriage and cross-slide can be had and the construction is such that the timing will, under no circumstances, vary. For longitudinal adjustment of the carriage, a screw adjustment is provided to the roller slide and this facilitates rapid set up of the machine.

Cross-Slide Drive

The front cross-slide which has a power cross fed of 2 in. obtains its power directly from a pair of bevel gears, one being mounted in line with the carriage feed worm, the other connected with the carriage shaft. In one end of the clutch, a screw pinion, integral with the shaft, transmits the power to a circular cam that supplies the clutch motion for the front cross-slide. This construction makes possible any movement between 0 and 2 in., and allows the cross-slide to be fed into the required depth while the carriage is either stationary or in longitudinal motion. An important feature is the cam construction that allows the cross-slide to stop positively at a set point each time. The entire feed mechanism is simple.

The rear carriage on which is mounted the rear cross-slide, is adjustable on the bed and may be placed in any position to suit the work. This carriage is unusually rigid, has a metal to metal contact, with rectangular ways for the cross-slide, and has gibs located beneath the ways of the slide. The purpose of this construction is to eliminate the spring to which the rear slide is subjected with the strain on the cross-slide upward instead of downward as in the case of the front-slide. The ratio between the width and length of the cross-slide is approximately 1 to 4. The construction is such that provision is made for obtaining longitudinal power feed on the carriage itself, but inasmuch as the occasions for using power feed on the rear carriage are so limited, this is not incorporated on the standard machine, but can be furnished when desired. The power feed construction to the cross-slide is by means of worm gearing and a cam, so proportioned that, even under the heaviest of strains, the back lash is reduced to practically nothing. The incorporation of the variable-stroke bracket allows a feed on the rear cross slide of either one-quarter of the feed of the front carriage or four times any feed between those limits. For shorter travel on the rear slide up to ½ in., it is possible to obtain one-twentieth of the travel of the rear slide as compared with the front carriage. These features of construction make it possible to obtain at all times uniform finish of the parts being machined.

The tailstock is of an unusually heavy construction having a spindle 4½ in. in diameter made from 0.60-carbon steel, heat-treated. An anti-friction center of rigid construction is used. With this rigid construction of the tailstock, an air-operated movement may be employed or if operated manually, a 12-in. diameter handwheel is provided, giving a movement of the tailstock spindle of 1 in. to each revolution of the handwheel. A simple locking device consisting of an eccentric clamp is provided. The spindle when properly clamped will not move even under the most severe conditions.

Specifications

Swing over front cross-slide, in.	13
Swing over rear cross-slide, in.	15
Swing over front carriage, in.	18½
Swing over rear carriage, in.	15
Swing over ways, in.	22
Spindle nose diameter, in.	5
Hole through spindle, in.	2½
Number of spindle speeds	12
Number of feeds	10
Manual adjustment—front cross-slide, in.	3½
Manual adjustment—rear cross-slide, in.	4
Manual adjustment—front carriage, in.	8¾
Manual adjustment—rear carriage, in.	12
Max. feed travel, front carriage, in.	7
Max. feed travel, front cross-slide, in.	2
Max. feed travel, rear cross-slide, in.	5
Min. dist. from point center to face of spindle nose, in.	4½
Max. dist. from point center to face of spindle nose, in.	20¾
Max. travel of tailstock spindle, in.	5
Speed of drive pulley, r.p.m.	600
Width of belt, in.	6
Motor recommended	5 hp. to 15 hp.—1,200 r.p.m.
Distance from floor to center of spindle, in.	39
Floor space, in.	75x55

Allen-Bradley Push-Button Starters

A complete line of a.c. and d.c. push-button starters, ranging from ¼ to 10 hp., 220 volts d.c., and up to 15 hp., 550 volts a.c. giving complete protection to operator, motor and machinery, was recently placed on the market by the Allen-Bradley Co., Milwaukee, Wisconsin.

The a.c. and d.c. switches of similar rating have the same external dimensions, thus helping toward standardization of motor-driven machines. The covers on all starters swing to the side for convenience of inspection. The cover can be locked against tampering and injury to any employee not authorized to open the box. All parts of the switches are readily accessible for inspection and

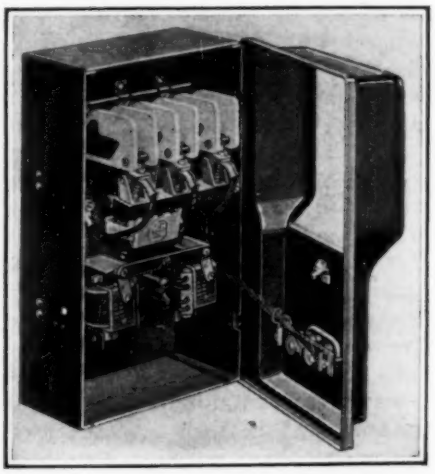

Fig. 1—Allen-Bradley Push-Button Starter, A.C. Type

ample room is provided for wiring. The a.c. switch is shown in Fig. 1, while in Fig. 2 the d.c. type is shown.

Both the a.c. and d.c. switches are made in three forms. Form 1 shown in both illustrations has a "start" and "stop" push button mounted in the cover. Form 2 is designed for operation with an outside push button, while Form 3 has a lever on the cover giving two-way control, manual and automatic.

The a.c. starter gives protection against overload, no-voltage, and single-phase operation. An outside reset lever makes resetting of the induction-type thermocouples convenient. Arc shields are used on all switches and magnetic blowouts on the larger sizes of both series.

The d.c. starter gives positive start-

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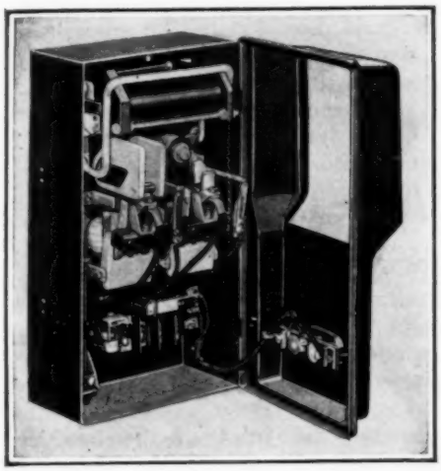
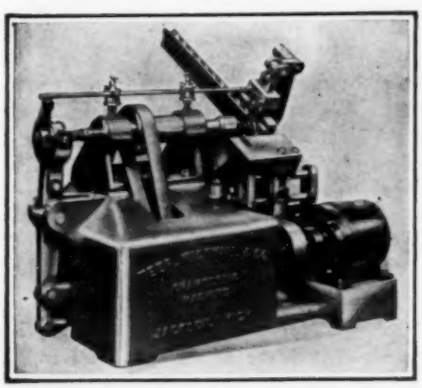


Fig. 2—Allen-Bradley Push-Button Starter, D.C. Type

ing, no-voltage, and overload protection. A special graphite compression resistor gives smooth stepless acceleration until all resistance is cut out at full speed of the motor. Patented resistance-type thermo-overload relays give accurate overload protection.

Teer-Wickwire Automatic Chamfering Machine

An automatic machine for chamfering holes in screw-machine products has been developed by Teer, Wickwire & Co., Jackson, Mich. A production of 60 to 100 pieces per minute is claimed, being limited only by the ability of the operator to place the parts in the magazine. The unit has a capacity for parts ranging from $\frac{3}{8}$ to $1\frac{5}{8}$ in. in diam. and from $\frac{1}{8}$ to 2 in. in length. Hexagonal or octagonal parts may be chamfered by the use of a special attachment furnished extra. The machine is built for one particular size, and to chamfer other parts it is necessary to change the magazine and ejector plates. These extra parts can be supplied by the company or made by the customer.



Teer-Wickwire Automatic Chamfering Machine

For operation the parts are loaded in the magazine with the side to be chamfered towards the chamfering tool. The column of parts rolls down the magazine and stops against the ejector plate so that the lowest part is located approximately concentric with the chamfering tool. A gripping jaw prevents this part from turning and at the same time centers it. The spindle carrying the chamfering tool advances, chamfers the part and returns to its back position while the gripping jaw releases. The ejector plate removes the bottom part from the columns of parts in the magazine and the entire column moves down one part, thus placing a new piece in position for chamfering.

All parts subject to wear are hardened or bronzed bushed, and adequate provision is made for oiling. Two adjustable trays are provided for the operating side of the machine, the upper one to hold a tote pan of unchamfered parts near the mouth of the magazine, the lower one to hold a tote pan into which the chamfered parts are discharged.

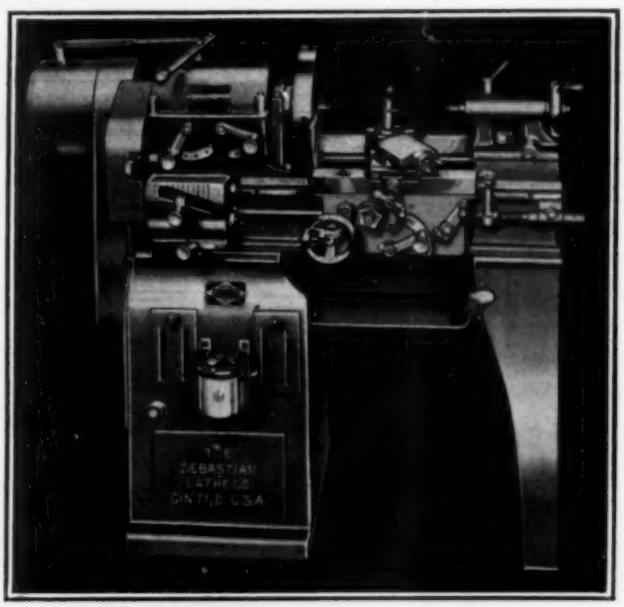
The number of strokes per minute may be easily changed by substituting different change gears. The chamfering spindle runs at 900 r. p.m. and has a stroke of 1 in. and can readily be adjusted to suit pieces within its range. The machine is arranged for motor drive in which case a $\frac{1}{4}$-hp. motor at 1,800 r.p.m. is required. The machine is designed to be mounted on a low bench where it occupies a space of 15x30 in. The weight is approximately 450 pounds.

Sebastian 11-Inch Precision Lathe

A SMALL high-speed lathe for production or precision work with all the engine lathe features was recently designed by the Sebastian Lathe Co., Cincinnati, Ohio. It is also recommended for training school purposes. The lathe will swing work 12 in. in diam. over the bed and $22\frac{1}{2}$ in. long between centers. There is a $1\frac{1}{4}$-in. hole through the spindle and the collet capacity is $\frac{7}{8}$ in. The machine is furnished in bed lengths of 3, 4, 5 and 6 feet. Drive may be either by a self-contained motor or a single pulley. When motor driven, a $\frac{3}{4}$-hp. motor at 1,200 r.p.m. is recommended. It can be furnished in an a.c., either single or multi-phase, or in a d.c. type. The motor is built in underneath the headstock and there is a cabinet below the motor for tools. The motor itself is belted to a constant-speed pulley by a 2-in. belt which has cast-iron guards. A patented type belt tightener controlled by a lever at the rear of the leg is featured by the manufacturers.

The headstock contains all steel gears, and eight speeds are available, ranging from 26 to 260 r.p.m. These are selected by two shift levers on the front of the headstock. At the top of the machine is a stop and start lever for controlling the friction clutch. Reverse for cutting left-hand threads is obtained by throwing the yoke into a different position.

Feeds and threads are obtained by two levers on the quick-change feed



Sebastian 11-Inch Precision Lathe

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box. One lever slides on the quick-change tumbler shaft, and no loose gears are used. A shear pin at the end of the box prevents overload. The thread range is from 6 to 96 threads per inch.

The carriage is of generous proportions and has bronze shear wipers. The cross feed collar is of the friction type and is graduated. The compound rest collar is of the same type and is also graduated. It has a travel of 2-in. A depth stop is provided for chasing threads and a thread chasing dial is incorporated.

The tailstock spindle has a travel of 4-in. and is graduated. The tailstock can be set over $\frac{3}{4}$ in. Regular equipment includes a steadyrest of 3-in. capacity, centers and the necessary wrenches. Other attachments are available at extra cost. The weight of the 4-ft. bed model, crated, is 1,000 lb. approximately.

Demco-Bradford Unit Drilling and Tapping Head

TO MEET the present-day demand for high-speed automatic drilling, tapping, countersinking and reaming, the Demco Drilling Machine Co., Cleveland, Ohio, and the Bradford Machine Tool Co., Cincinnati, Ohio, are jointly placing on the market two sizes of a unit-type drilling and tapping head. The head is shown in Fig. 1, while in Figs. 2 and 3 certain of its parts are illustrated. These heads are of the self-contained type, with the motor and feed mechanism built into a compact unit. One or more heads can be built into a machine at any angle from the horizontal to the vertical to suit conditions.

The heads operate on a predetermined cycle, having a definite spindle travel of 3 in., with a 2-in. adjustment. The cycle consists of rapid approach to the work, actual cutting feed and rapid return after the operation is completed.

The cycle of operation is imparted to the spindle by means of a positive-feed cam, driven by a clutch from the spindle. It makes one complete revolution or cycle each time the starting lever is depressed. The feed mechanism then remains idle until it is engaged again by the operator. To make the operation continuous or automatic, the tripdog for the starting lever is disengaged. An emergency lever is also provided for instantly stopping the entire mechanism.

By means of pick-off gears in the housing between the motor and drill head, the spindle speeds can be varied from 75 to 2,000 r.p.m. A rate of feed from 0.005 to 0.03 in. per rev. is available by changing other pick-off gears readily accessible after removing the cover at the side of the head. The depth of actual feed in relation to the constant cycle can be varied by changing the cam.

A power take-off rod extending through the front of the head is provided for automatically clamping or locating the work, while the automatic indexing or dial feed is accomplished through a crank arm attached to a stub shaft extending from the side of the head. This stub shaft makes one revolution during each cycle.

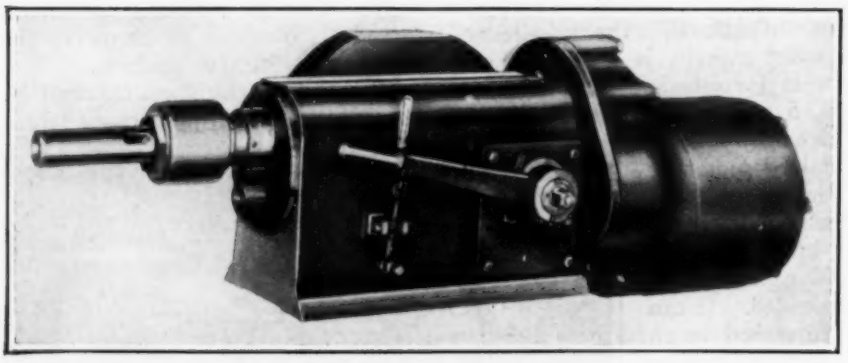

Fig. 1—Demco-Bradford High-Speed Unit Drilling and Tapping Head

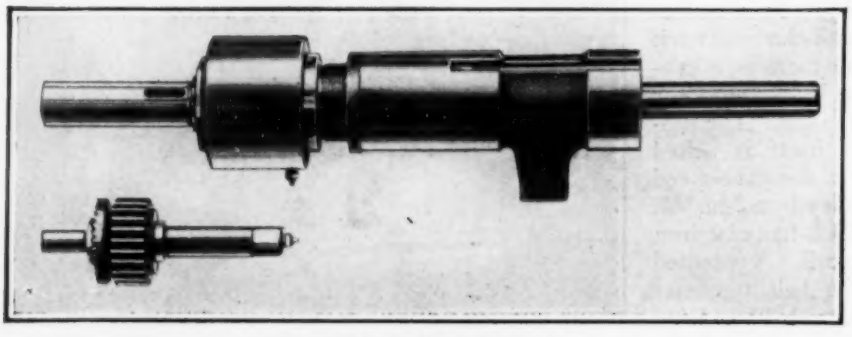

Fig. 2—Spindle construction

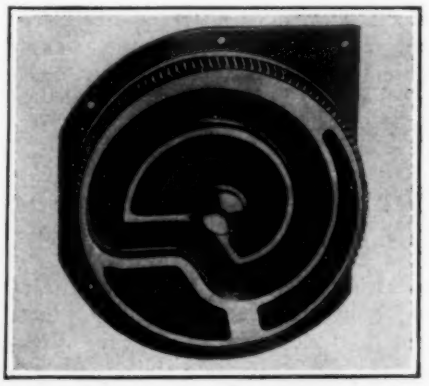

Fig. 3—Feed mechanism

The tapping mechanism is built into the head, making a complete unit. It employs a positive rise cam for the desired lead to the spindle to correspond to the tap lead. The return of the spindle is also controlled by the cam and, therefore, does not depend upon the tap for its return. Thus, the entire operation is governed by the cam and pick-off feed gears. The range of speed on the tapping spindle is the same as the drilling spindle, while a thread lead from 8 to 32 threads per in. can be obtained with standard pick-off gears.

The two sizes of heads now in production are known as Nos. 1 and 2, respectively. The No. 1 head requires a 1-hp. motor for driving, and the spindle has a No. 2 Morse taper. The drilling capacity is $\frac{1}{4}$ to $\frac{3}{4}$ in., and the tapping capacity from

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¼ to ½ in. The No. 2 head requires either a 2- or 3-hp. motor for driving, and the spindle has either a No. 3 or 4 Morse taper. It handles drills from ¾ to 1⅛ in. and taps from ½ to 1 in. The spindles are arranged to receive standard makes of multiple drill heads. The minimum distance between the spindle center and column face is 8 inches.

Rockwell Continuous Annealing Furnace

A CONTINUOUS annealing furnace of the conveyor type for annealing and heat-treating ferrous and non-ferrous metal parts without the use of trays has been developed by the W. S. Rockwell Co., 50 Church St., New York. Continuous charging and discharging and individual exposure of the unit pieces are featured. The stock can be of various shapes and sizes.

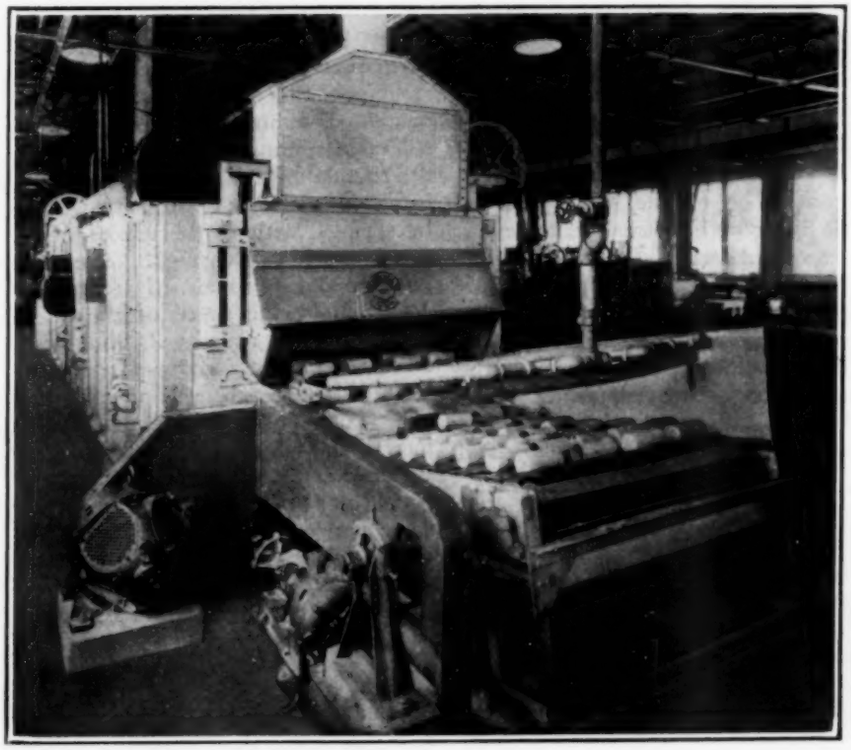
An alloy metal conveyor of special design, operating within the furnace, permits charging at random and movement without distortion through the furnace and delivery to a shower or bath for cooling. For normalizing the stock is cooled individually by the circulation of air.

Control of time and rate of heating and cooling as well as temperature, is automatic. The rate of heating and cooling may be varied to suit requirements, however. Provision may be made to discharge from inside the chamber or through the working opening as may be desired.

The heating chamber is materially larger than the charge in order to avoid local heating and is designed to maintain uniform pressure of atmosphere on the floor. Spent gases are utilized to preheat the stock and to preheat the air for combustion when fuel is employed as a source of heat. The construction throughout is unusually heavy to provide for ample heat storage, insulation, and comfortable working conditions.

The absence of pans or trays is claimed to be advantageous for several reasons: Because of the saving in heat otherwise lost, the avoidance of high and closely packed charges, the elimination of labor in handling trays and the provision for more comfortable working conditions for the operators.

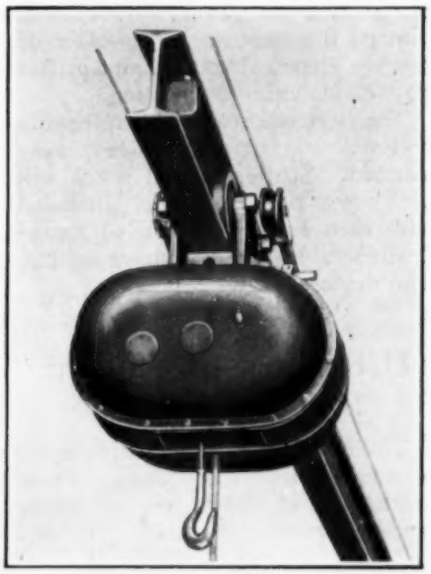
Electricity, oil or gas, with provision for automatic control, may be used for generating the heat with corresponding changes in detail design of the furnace without, however, departing from the principle of heating and handling. Choice of electricity or fuel is dependent upon individual plant conditions. The size of chamber and working openings and the details of the conveyor construction can also be varied.



Rockwell Continuous Annealing Furnace

"Quick-Lift" ¼-Ton Electric Hoist

The American Engineering Co., Philadelphia, Pa., announces the "Quick-Lift" all-steel electric hoist of ¼-ton capacity. This is a high-speed unit with a pressed steel frame and chrome-manganese steel gears and shafts. It features in addition ball bearings throughout, non-spinning hoisting rope, oil-bath lubrication, push-button control, and upper and lower limit switches. All working parts are fully inclosed.



"Quick-Lift" ¼-Ton Electric Hoist

The hoist weighs 200 lb., and is made in two types, plain trolley and hook suspension. The plain-trolley type requires 16-in. and the hook-suspension type 18-in. headroom.

Fuzon Electrode Holder

The Fusion Welding Corporation, 103d St. & Torrence Ave., Chicago, Ill., has designed the Fuzon electrode holder for metallic arc-welding electrodes of all classes, particularly surfaced electrodes. The device is said to minimize overheating of the

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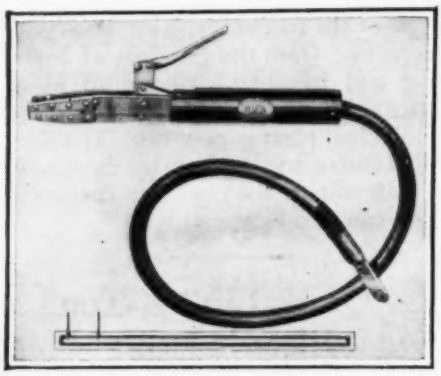


Fuzon Electrode Holder

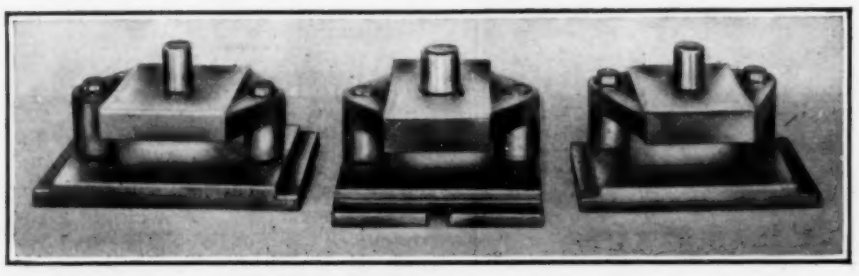
electrodes, and to give perfect contact under any and all conditions. When the electrode is placed in the holder, the jaws clamp and simultaneously push forward the electrode. This movement scrapes all surface materials from the four points of contact, thus assuring the welder of positive electrical contact and in this way eliminating overheating.

The electrode stub ends are readily removed and new electrodes easily inserted. Spattered weld metal will not stick to the jaw holder. Included with each holder is 3 ft. of extra-flexible cable and a connecting lug. The device weighs 2 pounds.

U. S. Tool Co. Standard Steel Sub-Presses

Twenty-three sizes and three styles of standard steel sub-presses are now available, and other sizes are being made to suit the demand. The sets are manufactured by the U. S. Tool Co., Inc., Ampere, N. J. The use of a good grade of machine steel in place of cast iron is said to result in the following advantages: Greater die space, because the plates are thinner for the same strength; maintenance of alignment, since the base will not distort after machining; and a bolster plate with large holes may be used, because of the strength of the sub-press. The base is made of machine steel and the top is of cast iron with a steel screw shank arranged for spring or knock-out. The pillars are of large diameter and are hardened and ground. They are provided with the usual oil grooves.

The three styles are shown in the illustration: Style SO is the open-plate type and has two leader pins at the rear; style SM has the leader pins centrally located in the side, while style S has the pins centrally located front and rear. The bushings for the leader pins are hardened and ground and are so assembled as to leave an oil groove between the top and bottom inserts to insure ample lubrication of the pin. The die space varies from 4 x 4 in. to 8 x 11 in. Special sizes may be had on order.



Three styles of U. S. Tool Co. Standard Steel Sub-Presses

Haigh Alternating-Stress Testing Machine

THE Tinius Olsen Testing Machine Co., 500 N. 12th St., Philadelphia, Pa., is placing on the market, as the sole American representative, the Haigh alternating-stress testing machine shown in the illustration. The machine is built by Bruntons, Musselburgh, Scotland, and its chief purpose is to determine the fatigue limits of metal, the theory being that a metallic structure is permanently safe only when the stresses are kept within the fatigue limit. On the Haigh testing machine the range of stress may be varied at will and measured with accuracy, the machine thus being capable of making rapid tests with high frequencies of reversal. An important advantage claimed for this type of machine is the uniform distribution of the alternating stress across the full section and along a considerable length of the test piece. The machine may be applied in wide fields of research to test models of machine parts as well as simple test pieces of different materials, or of the same material with different heat-treatments or degrees of cold work.

The machine occupies little floor space, and stands 5 ft. in height. The test piece is placed on the center line of the machine immediately below the level of the handwheel. The adjustable head can be raised to take test pieces up to a length of 15 in., and the frame is arranged with clearance for special tests, or to allow an electric furnace to be placed around the test piece for tests at high temperatures. The range of tests is indicated on a special stress meter, which is mounted on the wall behind the testing machine. This range can be varied at will up to a maximum of 1½ tons.

The action of the machine depends on a pair of electro-magnets supplied with two-phase current from a small alternator. The forces generated by these magnets, pulling on opposite sides of a single armature, are transmitted to the lower end of the test piece, the upper end of which is gripped in a holder that forms part of the adjustable head. The magnets and adjustable head are rigidly connected by four vertical columns that form part of the main frame of the machine. Since all stresses are self-contained within this frame, no considerable vibration is transmitted to the foundation. The vibrating armature and connecting rods are guided by springs, without the use of lubricated slides or bearings. The frequency of reversal of stress is governed by the speed of the alternator, and is usually 2,000 stress-cycles per min., corresponding to 1,000 r.p.m. Each cycle of stress includes one pull and one push. Although the majority of tests are performed with stresses ranging between equal intensities of pull and push, the ratio between the extremes may be varied at will. The spring stiffness may be adjusted by the use of clamps, to suit widely different frequencies of operations.

The range of stress on the test piece may be varied by the use of regulators which control the voltage supplied from the alternator to the testing machine. A coarse regulator

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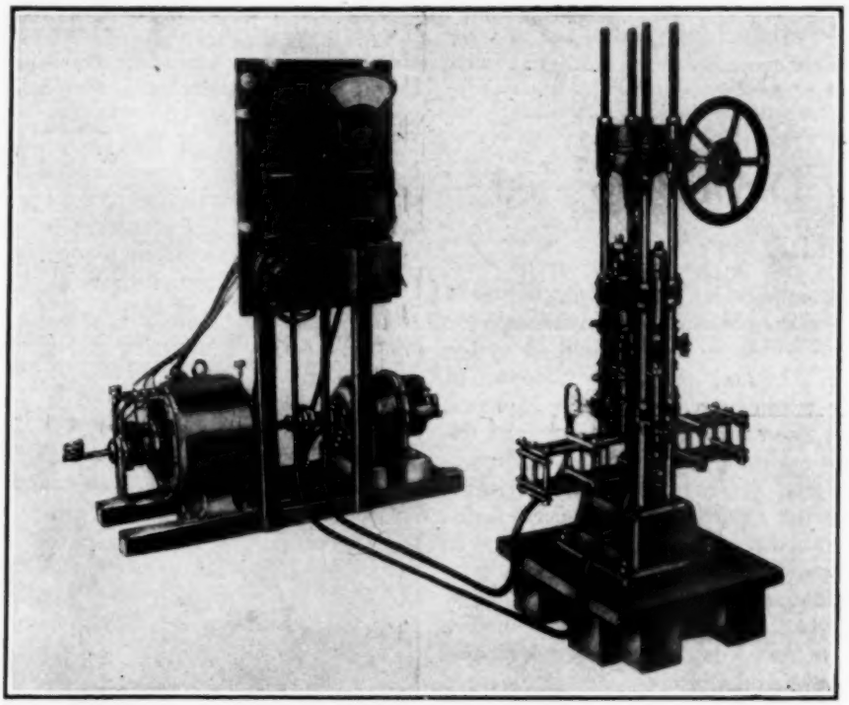


Haigh Alternating-Stress Testing Machine

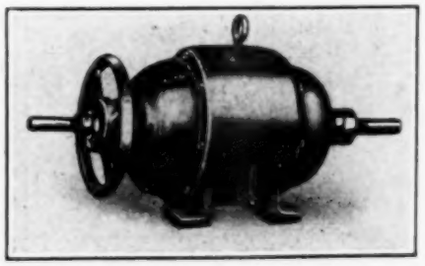
enables the range to be adjusted within wide limits, and a finer one affords more sensitive control. The electrical instrument provided for measuring the range of stress is fitted with a uniformly-divided scale that can be read accurately. The readings are interpreted by means of a calibration chart supplied with each machine.

Standard equipment supplied with the machine includes a switchboard carrying a combined stress-meter and differential ammeter with scale illuminated by a pilot lamp, a main-switch with automatic cut-out to operate on completion of the test, and two regulators (coarse and fine) for adjusting the range of stress. It also includes an alternator for generating two-phase current for 2,000 stress-cycles per min., fitted with automatic counter for recording the number of cycles required to break the test piece. It is recommended that the alternator should be driven by a 1-hp. electric motor, the two machines being mounted on a bed-plate.

Each machine is calibrated before being sent out, and a chart is supplied giving the load in pounds at all stress-meter readings. Calibration apparatus, consisting of a mirror, extensometer, and a specially designed camera, is supplied, and it is recommended that a fresh calibration be made after any change affecting the width of the air-gap between the armature and the magnet. Provided, however, the current remains the same as the value stated on the original calibration diagram, the figures of the original calibration remain applicable.

Stephens-Adamson Type JFS Variable-Speed Transmission

In the type JFS variable-speed transmission manufactured by the Stephens-Adamson Manufacturing Co., Aurora, Ill., speed changes can be made while the unit is in operation simply by turning the control wheel shown at the left of the unit in the illustration. A speed range of 5 to 1 is available. The unit is entirely incased within a housing that excludes dust, grit and moisture, and confines the lubricant which forms a constant oil bath.



Stephens-Adamson Type JFS Variable-Speed Transmission

The efficiency of this variable-speed transmission is said to be over 95 per cent at capacity loading. The machines are built in sizes from ½ to 15 hp. rating.

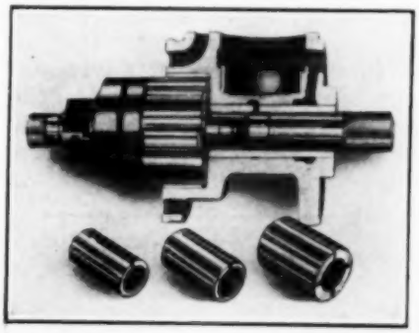
Blount Motor-Driven Grinders and Buffers

Erratum

In illustrating the article on the Blount motor-driven grinders and buffers on page 400, Vol. 67, of the *American Machinist*, a floor-type buffer was shown. It was erroneously labeled "Motor-Driven Grinder with Floor Stand."

Foster-Johnson Triple-Valve Reamer Guide

The Foster Johnson Reamer Co., Elkhart, Ind., has developed a sleeve and expanding adapter for piloting its triple-valve reamers central with the slide-valve bushings. The sleeve is bored and internally ground at the top end for receiving the pilot extending from the reamer body. The opposite end of the sleeve is threaded to receive the knurled hand nut and a tapered seat beginning where the threaded-portion end is ground.



Foster-Johnson Triple-Valve Reamer Guide

Split adapters which have tapered holes to fit the tapered seat on the sleeve are provided for the various sizes of slide-valve bushing holes. Four of these comprise the complete set for the type F-J AB-12 reamer.

For using this appliance the knurled nut is first removed from the sleeve and the proper size expanding adapter is placed over the tapered seat and the nut replaced. The en-

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tire sleeve and adapter are then inserted into the triple valve and the nut tightened against the adapter sufficiently to tighten firmly in the slide-valve bushing. In this position the opening in the end of the sleeve is firmly centered and is ready to receive the reamer pilot and guide it.

Keller Form-Turning Device Applied to a Lathe

THE Keller Mechanical Engineering Corporation, 70 Washington St., Brooklyn, N. Y., has placed on the market a device attachable to any screw-cutting engine lathe, having power cross feed, that enables the lathe to reproduce form work from a templet by means of an ordinary single-pointed lathe tool. If the lathe is already equipped with a taper turning attachment, the device may be clamped to it. If not, a special bracket may be bolted to the back of the lathe bed, as in the case illustrated in Fig. 1, which is an ordinary engine lathe of 18-in. swing. The outfit consists of a set of Keller magnetic controls used in combination with a standard Keller tracer head with the usual automatic controls. The arrangement is similar in general construction to that used in the Keller die- and tool-making machines, and makes it possible to turn accurately any intricate shape. The advantage claimed over other methods of form turning is that the templet may be made out of sheet metal and that the operation is entirely automatic in any direction. Pressure against the templet is very light, and the application of the device to a lathe does not affect its performance. The cut is in no way limited by the control, and the same amount of stock can be removed in a given unit of time as the lathe is capable of doing on straight or parallel work.

The device operates electrically. At the right-hand end of the lathe bed are two power boxes identical in appearance and principle, each containing a small electric motor, suitable speed reducing gears and clutches. One box drives the regular lead screw, and the other drives the feed rod. The locknut in the apron of the lathe remains closed upon the lead screw, and the cross feed is in engagement with the feed rod. The motors operate continually, and the clutches for engagement are controlled magnetically through the tracer mechanism. Initial feeds can be set through push buttons and drum controllers contained in a cabinet placed at the side of the machine.

The templet is made of heavy sheet steel, and the contour edge represents the mid-section of the solid being formed. This templet is clamped flatwise to the rear wing of the carriage, and the position of the control device is adjusted so that the lower end of a short vertical lever or pendulum depending therefrom will bear against the templet.

The upper end of the pendulum is provided with two sets of electrical contacts in two planes at right angles to one another. These contacts control a low-voltage current to operate relays controlling the clutches in the power boxes. The pendulum is free to swing (an almost imperceptible distance) either parallel to or at right angles to the lathe bed. The movement of the pendulum is caused by the contoured edge of the templet bearing against the lower end of the pendulum as the template advances with movement of the lathe carriage.

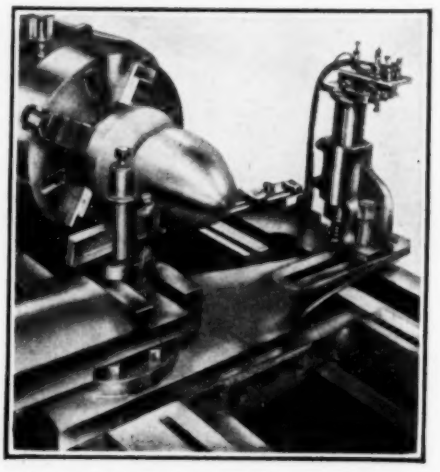

Fig. 2—Tracer mechanism mounted at the end of the carriage

As soon as the mechanism is put into motion by pressing the button of the starting switch, the tracer head, through the action of the clutches, is moved over the edge of the templet, starting at either end in case the average contour runs parallel to the movement of the lead screw, or from outside to center or reverse if the average movement is parallel to the movement of the cross slide. The feed is synchronized with the number of turns of the lathe spindle, and may be set to any dimension covering a large range. The cutting tool is thus permitted to advance a predetermined amount with every revolution of the spindle. The path of the tool point over the contour is a series of very minute steps.

The attachment can be used for the production of many odd-shaped pieces; such as spinning chucks, and blanks for form cutters.

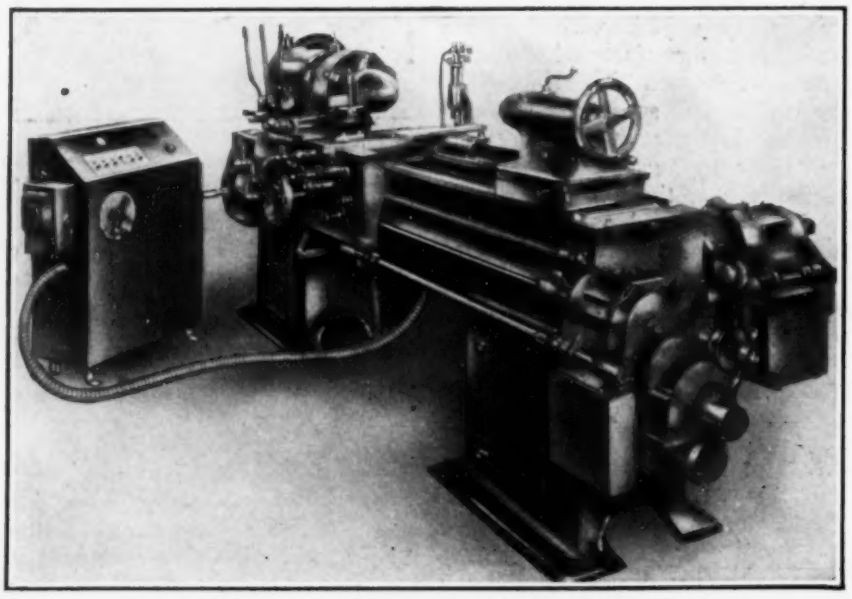

Fig. 1—Keller Form-Turning Device Applied to a Lathe

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Ryerson Combination Shear, Punch and Coper

IN THIS combination machine made by Joseph T. Ryerson & Son, Inc., Chicago, Ill., four single tools are incorporated for punching structural shapes, plate and bar shearing, angle and T cutting, angle and T mitering, coping and notching. The combination of these tools in a single machine is said to minimize floor space and to centralize such work.

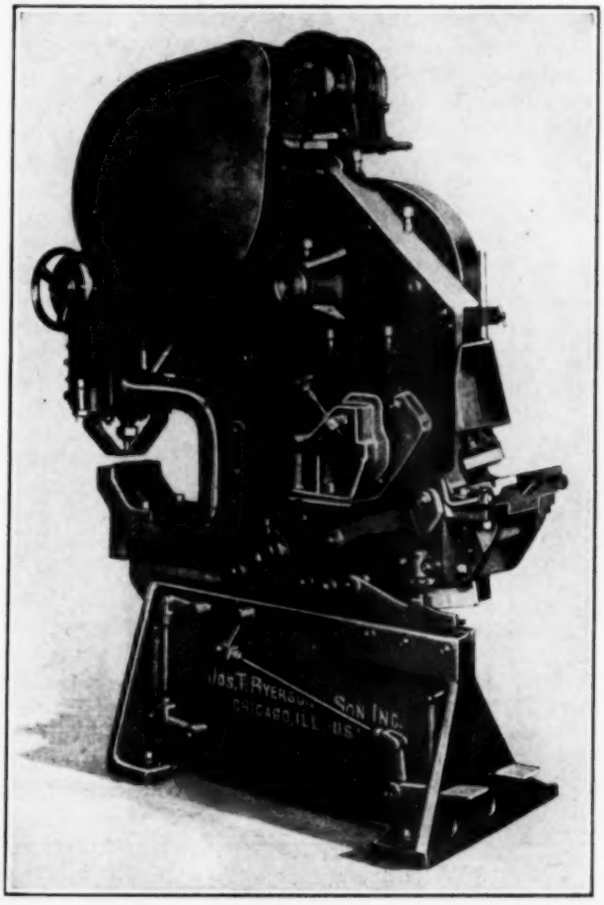
The punch is capable of handling a wide variety of structural shapes. The frame at this point has a 15-in. throat and is arranged for an architectural type of jaw block. Two standard architectural jaws are furnished with each machine. A universal hold-down takes care of stripping any material in punching. The operation of this punch is not interfered with in any manner by other units built into the machine.

The shearing end of the machine is constructed so that a single slide handles the shearing of angles, bar cutting, plate shearing and coping. The angle shear attachment handles both inside and outside miter cutting as well as straight shearing. The blades in this unit are made in sections so that they can be sharpened easily and replaced readily. The bar cutting blades are located directly below the angle shear blades. These cutters handle both square and round sections and consist of two blades only. Directly below the bar cutter are located the plate shearing blades. This device handles plates of any width or length up to $\frac{1}{2}$ in. thickness. The coping device is built at the shear end of the machine and is extended out from the frame and located at a convenient height for operation. This is also a built-in feature so that no time is lost in making special set-ups for this class of work. The coping device is regularly furnished in the V-notch type, but the square-notch type can also be provided. The machine will shear round bars up to $1\frac{1}{4}$ in. in diam., square bars up to $1\frac{1}{2}$ in., angles up to $4\times4\times\frac{3}{8}$ in., flat bars up to $6\times\frac{5}{8}$ in. and notches in $3\times3\times\frac{5}{16}$-in. angles and Ts.

At the plate shear the frame is offset so as to allow the free passage of plates in splitting. A hold-down device, adjustable vertically, is provided for the splitting shear. The swinging head of the splitting shear end is provided with an extension to form the upper blade holder for coping and notching work.

The machine makes 35 strokes per min. and is arranged either for direct motor drive, as illustrated, or for belt drive. The drive is taken through all steel gears to alloy-steel eccentric shafts. The clutches are of the three-jaw type, so that the operator can engage the clutch each third of a revolution. The main frame of the machine consists of a one-piece alloy-steel casting, extending from the feet up to the motor shelf. The bearings throughout are bronze bushed and special care has been taken to provide proper lubrication. The working heights of the various attachments have been made such that the feet of the machine can be placed directly on the floor thereby eliminating the necessity of building up a concrete pier in order to bring the machine to the most convenient working height for the operator.

A 5-hp. motor is recommended. The unit weighs 5,100 lb. net.

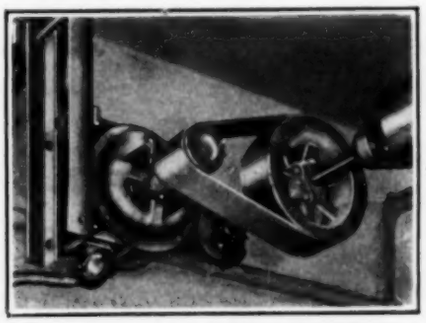


Ryerson Combination Shear, Punch and Coper

Rockwood "Uni-Pull" Belt Drive

A marked improvement in operating efficiency over fixed-center belt drives in short centers is claimed for the "Uni-Pull" belt drive developed by the Rockwood Manufacturing Co., Indianapolis, Ind. With this method of drive, the belt operates with uniform tension and at uniform speed in order to maintain uniform centrifugal force.

The drive consists of a Rockwood pulley and a motor so mounted that gravity maintains the belt under a predetermined tension to meet the power requirements of the installation. As can be seen in the illustration, the motor is mounted on the side of the frame which is suspended freely from the ceiling. The offset weight of the motor tends to produce rotation about the fulcrum, and this effect is resisted by the pull of the belt. Each particular installation must be designed to meet specific con-



Rockwood "Uni-Pull" Belt Drive

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ditions found. A patent has been applied for the method, and the company plans to license its use at a small charge.

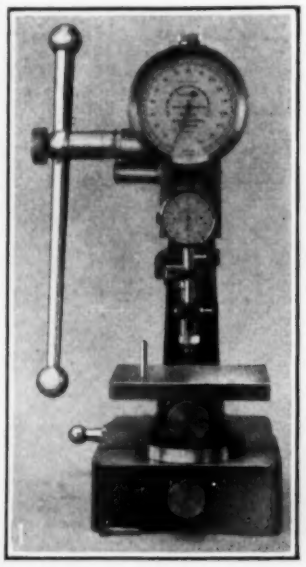
The Uni-Pull drive has been adapted to hammer-type pulverizers and crushers up to 50 hp., and on some machine tool applications. The use of excessively tight belts on short-center drives has been obviated, and shrinkage strains due to atmospheric changes are also eliminated. Belts have been run at extremely small distances between the driving and driven pulleys, so close as to almost touch each other.

"Wizard" Quick-Change Chuck—*Erratum*

On page 525, Vol. 67, of the *American Machinist*, the statement was made that the "Wizard" quick-change chuck had been added to the line of tools of the J. C. Glenzer Co., Detroit. As a matter of fact it was the "Wiard" chuck, formerly made by the American Standard Tool Works of Detroit, that was sold. "Wizard" quick-change chucks and collets have been and still are manufactured by the McCrosky Tool Corporation of Meadville, Pennsylvania.

"Monotron" Constant-Diameter Hardness Indicator

FOR the measurement of what is known as quantitative and qualitative hardness in metals and all other materials such as minerals, glass and organic compounds like rubber, the "Monotron" hardness indicator was developed by the Shore Instrument & Manufacturing Co., Van Wyck Ave. and Carll Street, Jamaica, N. Y. The instrument is a static mechanical pressure machine acting on a small diamond ball impressor through a specially-designed high-duty weigher or pressure scale. The resulting depth of impression under load is measured by a standard dial gage. The pressure scale has a capacity of 160 kg., or 352 lb. The operation of the unit has been made practical by the introduction of a compensator device on the indicator that serves to correct the hitherto unavoidable errors due to contraction of the parts in the machine and the diamond itself when under strain. The diamond ball point is $\frac{5}{8}$ mm. in diam. and is made to penetrate the material to a depth of 9/5000 in., thus producing an impression diameter of 0.36 mm. The comparative hardness of the material is measured in terms of the pressure necessary to produce this constant impression. The result can be expressed in per cent of hardness as compared with steel of known hardness. If the material is quite soft, such as rubber or fiber, a comparison can be made against a soft metal such as copper, which in turn can be standardized against hard steel. The diamond size was chosen so that the scale will include all metals from the softest up to the hardest steel without unduly straining the diamond on hard specimen. The resulting impression causes slight injury to the finished surface. In a scale of 160 kg. a substantial margin of overcapacity is allowed since a superhard steel rarely exceeds 125 kg. under standard conditions.



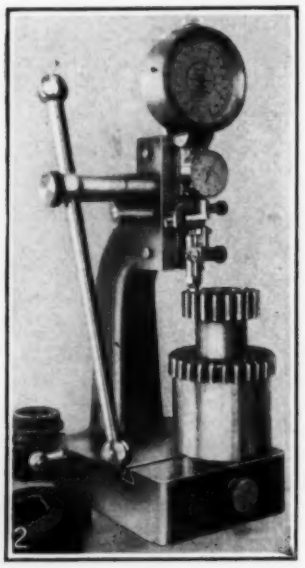


Fig. 1—"Monotron" Constant-Diameter Hardness Indicator with Removable Tilting Table. Fig. 2—Hardness Indicator set up for large pieces

Special scales may be applied to the instrument to read in terms of Scleroscope and Brinnell hardness numbers, or unit stress values may be used. A diamond of any other shape or standard steel balls of larger size may be used for special purposes, particularly for accelerating the examination of soft metals. By a comparative method, these values are always reducable to the standard values.

By means of a flat end punch of constant diameter, it is possible to measure the comparative ductility of metals. In this case a constant pressure is applied, 125 kg., and the depth of impression is the variable factor, being proportional to the ductility. It is also possible to measure the depth of hardness by plotting the load against the depth of impression. If a steel specimen is decarbonized so that it is harder inside than out, the increment line will bend upward; if on the contrary the specimen is case hardened, but of limited depth, the increment line will bend downward as the load is increased.

In Fig. 1 Model A is shown complete with a removable tilting table, while in Fig. 2 the instrument is shown with the table removed for the testing of large-size pieces, such as the gears in the illustration. In operation the specimen is put on the table of the machine with the top surface approximately level, and the ram is advanced downward until the hexagon cap contacts with the piece. The hand lever on the side is then moved until the lower or micrometer gage hand is moved to a responsive resting position, at which point the micrometer needle is adjusted to 0 through the medium of a thumb screw. The handlever is again moved until the idler pressure bar reaches the weigher mechanism. At this point the indicator hand on the large dial begins to move away from 0 and at the same time the hand on the micrometer gage also moves until the required depth of penetration is reached. For standard hardness measurement this would be 9 divisions of the scale. The pressure reading is then taken from the larger dial in kilograms or pounds. The operation is quite rapid.

Pressure is furnished through a simple plate spring loaded as a beam in the center and carried on roller bearings. The spring is checked with a weigher scale and is stressed well

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within its elastic limits, so as to maintain its accuracy over full range. A special built-in micrometer mechanism transmits the deflection of the spring to the needle of the dial.

The Model A Monotron hardness tester has a capacity between the base and impressor point of 7 in. The largest distance from the center to the back of the frame is 4¼ in. It has a minimum height of 17 in. and weighs 61 pounds.

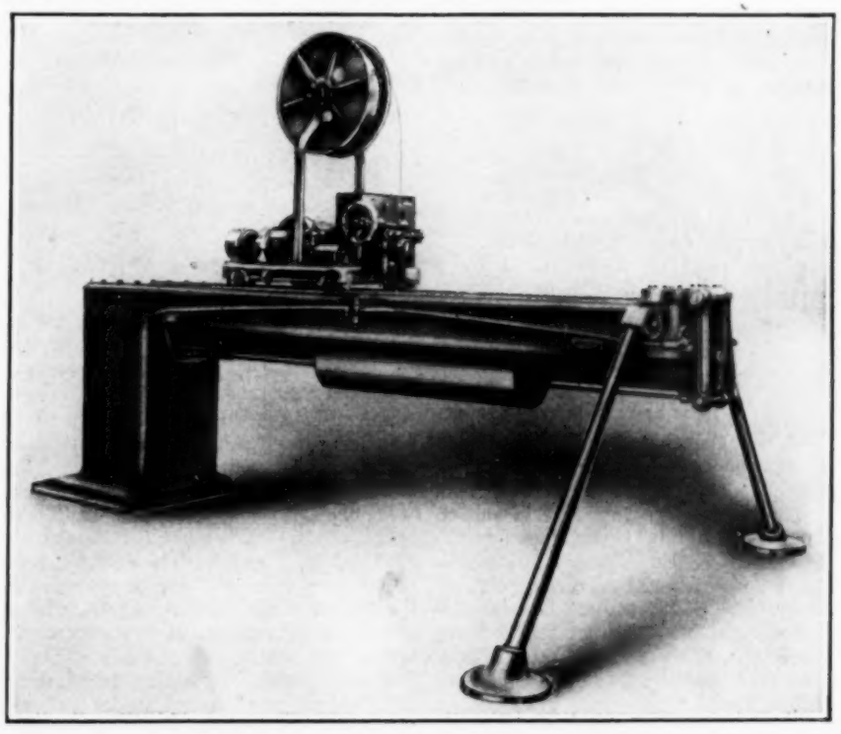
Westinghouse Automatic Arc Seam Welder

THIS automatic, longitudinal-seam arc welder developed by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., is especially recommended for the manufacture of pipe and tanks made from steel sheet and plate varying in thickness from $\frac{1}{16}$ to $\frac{3}{8}$ in. The standard machine will handle pipe and tank barrels varying in diameter from 10 to 40 in. and up to a maximum length of 8 ft. Greater diameters may be accommodated by providing a pit in the floor.

The machine consists of two parts, a clamping mechanism for holding the material to be welded and an automatic-arc, traveling welder for making the weld.

The clamping mechanism is attached to a horizontal bridge, supported at one end by a heavy base, and at the other by a pipe support. This bridge consists of two parallel beams about 4 in. apart. Below the space between these beams and parallel to them, projects a standard railroad rail as a cantilever from the heavy base. The tank to be welded is slipped over the free end of this rail and is clamped tight by compressed air clamps with the seam to be welded extending along a copper backing strip on top of the rail.

On top of the two parallel beams is machined a track for the traveling welder. This welder consists of a carriage containing a driving motor, an automatic arc welder, and a reel of welding wire. The carriage is driven in either direction along the cast-iron bridge through a reduction gear which may be adjusted to speeds from 5 to 50 in. per min. The welder automatically feeds the welding wire to the arc and maintains a uniform arc voltage, thus producing a uniform welded seam.



Westinghouse Automatic Arc Seam Welder

The welding current may be varied from 175 to 300 amperes. The carriage runs on roller bearings and is equipped with a clutch by which it may be released from gear and rolled freely along its track. Thus no time is lost in cases where it is desired to return the carriage to its starting position in order to build up each weld in the same direction.

This machine can be furnished in modified form to handle work with diameters as small as 6 in. and with a maximum length of 20 ft. However, in cases requiring special material-clamping equipment, the traveling welder is furnished as a separate unit.

Sossner Combination Stamping Die

A steel die of improved form has been developed by A. J. Sossner, 361 West Broadway, New York, to stamp out in one stroke intricate designs in sheet metal such as the trade mark shown in the illustration. The quality of the work done compares favorably with that of ordinary blanking

Fig. 1—Sossner Combination Stamping Die, top half

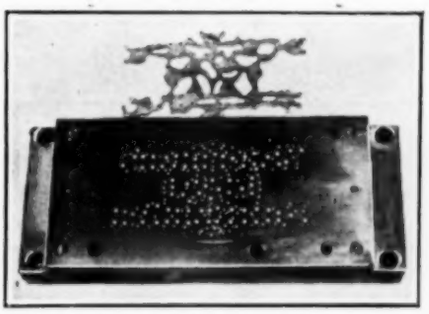


Fig. 2—Lower half of Sossner Combination Die

dies and the life of the tool is said to be longer.

The die is constructed of high-quality high-carbon steel, carefully hardened so as to be free from warpage. In order to maintain accuracy, the work of cutting the outlines of the designs is done under a magnifying glass so that positive register is

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assured. The die is made slightly convex so as to produce a slight shearing action.

The principal feature of the die is the large number of stripper pins used to eject both the completed stamping from the sheet and the small pieces punched from inside the letters in the example illustrated. The stripper pins are carried in plate of intricate form, which is shown at the top of Fig. 2 and which is placed within the die itself. This plate is backed up with powerful helical springs. Both the upper and lower die contain such stripper plates. The upper die carries four pillars to assure proper register with the lower one.

The principle of design can be applied to a variety of sizes and shapes. It is the subject of a patent application.

Improved "Clarite" High-Speed Steel

After considerable research, the Columbia Tool Steel Co., Lincoln Heights, Ill., has improved the quality of its "Clarite" high-speed steel, so that an increase of 5 per cent in production can be obtained. The steel is also said to be stronger and more flexible than that made under the old formula. This high-alloy steel differs from the old Clarite principally in a marked increase in vanadium and a small reduction in tungsten. It is hardened at a temperature between 2,350 and 2,450 deg. F., and drawn at between 1,050 and 1,100 deg. F., as was done previously. The new steel takes a full hardness at a slightly lower temperature than the old.

Trade Catalogs

CRANES AND TROLLEYS. H. D. Conkey & Co., Mendota, Ill., recently published catalog No. 100 on their cranes and trolleys. This publication contains forty-four 8½x11-in. pages and is attractively illustrated throughout. "Conco" trolleys are listed for straight plate and I-beam use, in plain, ball- or roller-bearing types. Among the cranes are listed wall bracket cranes, jib cranes, hand-power push cranes, hand geared cranes, side-braced hand-power cranes and electric power cranes of various types. Dimensional data, and engineering information are given.

GEAR INSPECTION. The Fellows Gear Shaper Co., Springfield, Vt., has prepared a descriptive bulletin on its "Red Liner," a new machine for automatically charting a permanent record of errors in gears under conditions closely approaching those of actual operation. Several photographs are used to show the construction of the machine while various sample charts are included to illustrate its use and sensitivity. The gear to be tested is run with a master gear and the fluctuations of drive recorded.

GEAR GENERATORS. The Fellows Gear Shaper Co., Springfield, Vt., recently published an interesting booklet entitled "The Practical Art of Generating." It contains seventy-two 8½x11-in. pages and is attractively illustrated throughout with imitation wood cuts. The principles of the generating process are first enunciated and illustrated by examples in mechanical drawing and simple machine work. The remainder of the book is devoted to specific problems arising in generating gears for particular purposes, such as printing presses, automobiles, bicycles, automatic machinery, internal clutch gears and numerous other spur gear applications, as well as helical and worm gears. Practically the entire industrial field is covered. In all cases the Fellows gear generator and a pinion-shaped or other form of generating cutter is used.

HEAT-TREATING. The Stanley P. Rockwell Co., Hartford, Conn., has available for distribution Catalog No. 2709 describing Rockwell Dilatometers for the Volcrit method of heat-treatment. The pamphlet contains twenty 8x10-in. pages and is well illustrated throughout with large photographs and charts. The control of heat-treating by dilatation is first explained, followed by a description of the instrument and its operation.

PUNCH PRESSES. The F. J. Littell Machine Co., 4125 Ravenswood Ave., Chicago, Ill., has issued catalog No. 27 on its automatic feeds for punch presses. The publication contains forty-eight 6x8-in. pages and is well illustrated throughout with photographs. Single and double roll feeds, with or without scrap cutters, are described as well as rack-and-pinion roll feeds and various attachments such as straighteners. Dial, magazine, hopper and special types of feeds are also included as well as some special machinery.

THREADING EQUIPMENT. John Bath & Co., Inc., 9 Grafton St., Worcester, Mass., published catalog No. 11 under the name "Ground Thread Handbook." The booklet contains seventy-two 5½x8-in. pages, well illustrated throughout by photographs and line cuts. Besides descriptions and price lists of the various type of taps, chasers, thread gages and rolling dies made by this company, considerable useful engineering information is given. This information includes tapping instructions and suggestions for reducing tapping costs. Notes on up-to-date gaging practice, including recently adopted standards for U.S.S. and S.A.E. thread gages, and a list of tap standards adopted by the National Screw Thread Commission are given. There is also a complete discussion on Acme thread tapping in relation to the Bath progressive-cut Acme tap. In conjunction with this company's internal micrometer for the gaging of holes, a general discussion on internal measurements is given.

WOOD-SHAPING MACHINES. The Defiance Machine Works, Defiance, Ohio, has prepared an illustrated catalog describing its line of ball-bearing motor-on-spindle and belt-driven wood-shaping machines. This line includes both single- and double-spindle vertical shaping machines, horizontal-spindle shaping machines and special machines for shaping particular parts such as automobile doors, steering wheel rims, shovel handles, plow handles, truck wheels and similar wood parts. A page of general information about frequency changers is also included.

Pamphlets Received

FATIGUE STRENGTH OF CAST IRON. The Engineering Experiment Station, University of Illinois, Urbana, Ill., has published Bulletin No. 164 entitled "Tests of the Fatigue Strength of Cast Iron." The publication contains fifty-two 6x9-in. pages and may be obtained from the University for 30 cents. It is illustrated with diagrams and microphotographs. The various methods of testing are outlined and data obtained are presented. The conclusions are summarized.

GOVERNMENT SPECIFICATIONS. An alphabetical index and numerical list of the United States Government master specifications, promulgated by the Federal Specification Board, is now available in circular No. 319 of the Bureau of Standards. Copies may be obtained from the Government Printing Office, Washington, D. C.

TESTS ON SPUR GEARS. Bulletin No. 3, published by the Engineering Experiment Station of the Virginia Polytechnic Institute, Blacksburg, Va., is Part I of a report on the efficiency, strength and durability of spur gears. This particular section is devoted to a force-efficiency anaylsis of the Lewis-Webb gear testing machine. The author is William H. Rasche. The bulletin contains forty-four 6x9-in. pages and is illustrated with charts. A description of the testing machine is first given, followed by a mathematical analysis of the loads involved. In order to simplify calculations of efficiency under varying conditions, gear dimensions and operating, several useful tables are appended.

NEWS OF THE WEEK

Regroups Bureau of Standards Activities

Director Burgess appoints heads for research and commercial standards

IMPORTANT changes in the administrative organization of the Bureau of Standards have been announced by the director, Dr. George K. Burgess. Under the new arrangement, Dr. L. J. Briggs will be assistant director in charge of research and testing, while Ray M. Hudson will be assistant director in charge of commercial standards.

Under Dr. Briggs' supervision will be all the Bureau's scientific research and testing, including the development, construction, custody, and maintenance of reference and working standards; their intercomparison, improvement, and application in science, engineering, industry and commerce.

In the second group, the formulation and co-ordination of commercial standards, with particular reference to the needs of industry, will be under the supervision of Mr. Hudson. Under his direct charge will be the division of simplified practice, the division of commercial standards, and that part of the work of the division of building and housing relating to codes and standards. In addition, the corelation of the work of the Federal Specifications Boards with commercial practice, and liaison work with other branches of the departments in questions relating to commercial standards will be among his duties.

When Dr. Burgess is absent, Dr. Briggs will act as executive head of the Bureau in the management and supervision of administrative, scientific, and technical work. He will also continue to act as liaison officer on matters of aeronautics between the Bureau of Standards, the aeronautics branch of the Department of Commerce, and other branches of the government concerned with this phase of activities. E. W. Ely, formerly assistant chief of the division of simplified practice, will become acting chief upon the promotion of Mr. Hudson, former head of this division.

Increased efficiency is expected to result from these changes in the administration of the Bureau. The regrouping is, in fact, a recognition of the importance of commercial standardization, which has grown with such rapidity in the last few years.

Dr. Briggs entered the Bureau of Standards in 1920 after having been associated with the Department of Agriculture. He was appointed senior scientist in 1925 and promoted to be chief scientist in charge of the Division of Mechanics and Sounds in 1927. Dr. Briggs is a graduate of Michigan Agricultural College, and of the University of Michigan.

Mr. Hudson entered the bureau after several years work in the industrial field where he specialized in waste elimination activities. During the war he was production engineer for the Emergency Fleet Corporation, having charge of the procurement of ships machinery. He is a member of the Taylor Society, the Society of Automotive Engineers, the American Engineering Council, the Society of Industrial Engineers and the National Research Council.

Industrial Safety Now a Science, Says Council

Seeking cures for every sort of accident that ever happened, and preventatives for those that may happen, drew approximately 5,000 members of the National Safety Council to the sixteenth annual Safety Congress of that association, which was held at the Stevens Hotel, Chicago, Sept. 26 to 30. Considerable attention was devoted to industrial and public safety, the aim being to point out means of reducing fatalities, resulting from accidents.

More than thirty sectional meetings were held, representing almost every branch of industry, in each case the keynote being the basis of accident prevention. Each section had its own meeting room so that the delegates could choose the classification peculiar to their divisions. The attendance by far exceeded any previous gathering.

Industrial safety has become such a science and so vigorously is it promoted that, nowadays, the loss of life and limb due to accidents in factories and shops is fractional compared with what it was. The great demand of the accident-prevention engineers, now, is for a better public safety. This was the plea in the message of Walter G. King, president of the council.

Industrial accidents yearly cause the death of from 18,000 to 25,000 persons. Even more deaths result from home accidents, the toll running about 25,000, which proves that the greatest work lies in pushing industrial and public safety propaganda. In industry, it is not so much the building of safer equipment as it is the teaching of workmen how to be careful.

H. E. Niesz, of the Commonwealth Edison Co., Chicago, was elected president of the council at the meeting of the board of directors. Other officers chosen were: T. G. Hellmuth, of the Chicago, North Shore & Milwaukee Railroad Co., treasurer; W. H. Cameron, of Chicago, managing director; vice-president for industrial safety, E. W. Beck, of the U. S. Rubber Co.; vice-president for public safety, Miller McClintock, of Harvard University; vice-president for engineering, G. E. Sanford, of the General Electric Co. and vice-president for health, Prof. C. E. A. Winslow, of Yale University.

Members elected to the metals section were: Chairman, J. A. Northwood, superintendent of safety, the Bethlehem Steel Co.; vice-chairman, E. G. Quesnel, safety engineer, the Commonwealth Steel Co.; Secretary, J. T. Eib, supervisor of safety, the Illinois Steel Co.

In conjunction with the congress was staged a safety exhibit on the sub-level floor of the hotel, at which many safety devices were exhibited. The exhibits demonstrated the latest improvements for the promotion of safety.

Among the score of divisions of the council, engaged in devising means to curtail accidental deaths, the specter of automobile deaths and accidents loomed above all stated causes in importance. From all the groups discussing this phase of desired safety, and practically all groups discussed it, there came the opinion that the biggest job in the scope of the council is the menace of motor traffic.

In connection with the accidents and deaths in industry, the following recommendations were made:

That all employees make a survey of their respective establishments, both large and small, to ascertain the why, where and how of accidents and accident prevention.

That employers keep and analyze their accident records for the purpose of devising ways and means of preventing the recurrence of accidents.

That employers safeguard, insofar as possible, all mechanical equipment, or revise manufacturing processes to eliminate these hazards.

That employers support efforts being made by community safety councils, the National Safety Council, federal, state and municipal officers and others, by conducting necessary organized accident prevention campaigns.

That employers encourage the inclusion of safety education in the courses of public schools and colleges.

That more colleges and universities incorporate safety engineering in existing engineering courses.

Modern Uses for Welding Processes Discussed at Detroit Meeting

Automatic operation growing in favor

AT THE fall meeting of the American Welding Society, which was held in Detroit during the week of the Steel and Machine Tool Exposition, the papers covered several interesting phases of the development of welding. Some of the more important papers are reviewed here in abstract form.

Welded structures have been used for more than five years on every type of military airplane, and there has not been a failure in service of a properly designed and properly manufactured welded joint, is the statement of J. B. Johnson, Chief of the Material Branch, War Department Air Corps, McCook Field, in a paper presented on "Welding the Aircraft Structure." Failures due to unskillful welding in aircraft work have been comparatively rare, and, to the author's knowledge, have never caused a fatal accident. The art of welding was naturally first used in the construction of the fittings between the individual parts of the airplane structure. The early airplane builders distrusted welding, and preferred, if possible, to make a fitting out of a continuous piece of sheet steel, very often making complicated twists and bends in order to obtain the desired result. The age of welding in its application to aircraft began when the oxyacetylene torch was applied to the fabrication of the fuselage, chassis, and control surfaces.

The development of the welded fuselage was largely due to the pioneer work of Anthony Fokker in Holland. The type of construction developed by him was used by American designers, with modifications to meet needs of particular designs. Metal fuselage has now practically displaced the old wood and wire construction. The welding of landing gears and control surfaces has become quite general, and has done much to simplify their construction. The use of welding in the wing structure has not advanced to the position of the welded fuselage on account of the difficulty of designing a steel structure which will compete with wood or light aluminum alloy on a strength-weight basis. If the aluminum alloy could be welded without a serious loss in strength, the problem of a light metal wing structure would be simplified.

Welding After Heat-Treatment

The practice permitted in the construction of aircraft, which probably would be considered questionable by metallurgists, is the welding of material after heat-treatment and its use without any reheat-treatment. One of the outstanding advantages of the welded airplaine struction is the ease of repair and maintenance. It has been the experience of the Air Corps, and of private commercial organizations, that welded steel structures are more durable than the wooden structures, and they are also much easier to repair and keep in flying condition. The metal airplane is unquestionably a safer vehicle for transportation than the wood and fabric airplane. In case of a crash, the fire hazard is reduced and the danger from flying splinters and collapse of the structure is lessened.

A paper on the Use of Welding in Car Construction was presented by V. R. Willoughby, General Mechanical Engineer of the American Car & Foundry Co. Mr. Willoughby gave the reasons why the American Railway Association prohibits welding on the most important parts of railway cars, and why a discrimination is made by the association in favor of forge welding as compared with gas and electric arc welding. He pointed out that, according to the definition of the A.R.A., the gas or electric arc method of welding does not result in a welded piece that is a homogeneous whole, as the weld in all cases is chemically and physically different from the parent metal. Until we have reached the point where a gas or electric arc weld of steel can be obtained without the use of flux, without oxidization taking place, without affecting the carbon content of the steel, and without changing the physical structure of the steel, it will be unwise to use gas or electric arc welding in the construction of high pressure tanks for the transportation of chemically active substances. It must be remembered, also, that the vital parts of a railroad car are subjected to many varying stresses other than those due to the static loading. There are quite a few cases on record where car wheels, axles and equalizers were welded by the gas or electric arc method, and subsequently failed in service.

Convince Railroad Men

Naturally, railroad men are very reluctant to substitute in place of riveting a welded construction which is difficult to inspect. It is admitted by the author, however, that there are many advantages of welded construction for cars, but he believes that a more extensive use of welding in the construction of railroad cars must be the result of a gradual growth. The railroad men must be convinced of the desirability and effectiveness of welded construction, and their convictions must be based upon the performance record of welded structures now in use. At the same time, the art of welding must progress to a point where either the skill required of the operator to make all kinds of welds perfectly has been greatly reduced, or where the possession of the skill required is so common among welders as to be deemed ordinary.

Welding of Automobile Parts was the subject of a paper presented by W. C. Happ, Chief Engineer, Department of Methods and Standards, Studebaker Corporation, and it gave a general explanation of what has been accomplished in welding practices at the South Bend Works of the Studebaker Corporation. The author gave as the two main reasons why automobile parts are welded that welding allows more leeway on the part of the designer, and also that it is cheaper. According to the author, it would be almost an impossibility to build an automobile as we know it today without the use of welding. Probably the most important point in obtaining proper welding is in the supply of experienced welders, and this was accomplished at the Studebaker plant by operating a welding school for the training of young, intelligent men as welders. Welding wire is also a matter of great importance when large quantities of it are being used, and it was usually found that what was considered best for a job was a compromise between quality and price.

Methods of Inspection

Various methods of inspection were developed, and also an attempt was made to eliminate as many different sizes of wire as possible, so that large orders could be placed for one size. For gas welding, torches were adopted, with an automatic cut-off in the handle, so that the flame is put out when the torch is hung up between operations, thus making a great saving in gas. In regard to the inspection of welds, it is well known that it is difficult to inspect a weld without destroying it. In order to assure that the inspectors were well versed in the process of welding, many of them were sent to the welding school for instruction before being placed on the job. In the case of very difficult welds, laboratory tests are made at regular intervals for check.

In a paper entitled "Some Metallurgical Observations on Welding," G. R. Brophy, of the Research Laboratory of the General Electric Co., argued that enough importance has not been attached to the metallurgical aspects of welding and the choice of materials used. According to the author, the quality of the steel welded has such a marked influence upon the properties of a weld that more rigid specifications should be drawn for the steel used in fabricating new structures. It sometimes occurs that a good deposited metal is contaminated by a poor quality of plate stock. The author also claims that time as a factor in welding is as important as is time in the heat-treatment of steel. The improvement of the properties of a weld by annealing is due to the fact that additional time is allowed for reactions to proceed which had been stopped by the rapid cooling of the weld. The rate of deposition, the current and voltage used, and the size of the electrode as related to the section of metal being

welded are also important factors in the production of better welds.

It is generally recognized that the so-called cored electrode is the most satisfactory for arc stability and general smoothness. One reason for coring is the difference in carbon content between the rim and the core, which will cause the core to melt at a lower temperature. Still another cause for coring is the difference in slag content of the core and the rim, the core being usually higher in slag than the rim.

According to the author, electrodes heavily coated with various materials, such as paper, asbestos, and other slag mixtures, have been in use for some time with excellent results. The arc is usually steady and quiet, and the deposits are of good quality. These heavy coatings act primarily as mechanical shrouds. Investigation of welds for porosity show that deposits made from very quiet arcs are much sounder than those from sputtering arcs. While considerable brittleness in welds is, no doubt, due to nitrides, most of it comes from oxides, and when oxides are eliminated by means of gaseous shields, excellent ductility of the metal results. With hydrogen-shielded arcs, the purity of the deposits is probably superior to all other gases. The use of alcohol vapor as a shield has recently yielded some remarkably good results, the deposits being very ductile and strong.

E. E. Thum, associate editor, the *Iron Age*, presented a paper on Heat-Treatment with the Oxyacetylene Flame. The author states that the proper application of the oxyacetylene flame to heat-treatment is somewhat limited, but that it is nevertheless important, even when confined to local hardening or annealing. It might appear to be a step backward to propose the small oxyacetylene flame for heat-treatment applied by hand, and without pyrometers to measure the effect. But the fact is that the oxyactylene flame is most precisely and completely controlled. Its temperature, though high, is unvarying, the gas atmosphere is neutral, and the action in production is so rapid that the operation proceeds with great smoothness.

Used for Hardening

The most wide-spread use of oxyacetylene flame for heat-treating is for emergency hardening of small metal cutting tools, such as lathe tools, milling cutters and drills. Emergency work may be done with economy and dispatch with the oxyacetylene flame. If a hardened tap breaks short off in a hole, it is easy to draw the temper by heating it to a red heat, so that it can be drilled out. Soft annealing is frequently done on sheet steel which has been heavily cold worked, yet must be further flanged at one region. Hard spots on castings can be easily softened with a blowpipe flame. A most important application is found in what is called localized casehardening. Hardening with the oxyacetylene flame is also done on parts which require hardening of only a portion of the surface. Such hardening in large-scale production is done on valve stems for gas engines. A large number of stems are arranged in a shallow pan and immersed in a circulating bath of water, so that only about one-half inch at the top of the rod appears. An operator heats each stem to the correct hardening temperature. The water bath cools the hot rod rapidly enough for correct hardness at the end. Spot hardening of malleable iron by the gas flame is another development. Very complex parts are treated in this way.

Chamber Councillors Will Discuss Economic Problems

The part that organized business is to play during the forthcoming year in the solution of outstanding economic problems, such as agriculture, flood control, taxation and merchant marine, will be shaped at a meeting of the national councillors, committees and board of directors of the Chamber of Commerce of the United States, to be held at West Baden Springs, Ind., Oct. 15 to 18. It will be the first meeting of the kind to be called by the national organization and the first conference on questions of national economic policy to be held in the Middle-West.

The meeting will, it is expected, bring to a focus opinion of business executives representing organizations in every state. Invitations have been extended to more than one thousand national councillors, each representing a trade association or commercial organization in the membership of the national chamber; and approximately two hundred officers, directors and members of special committees dealing with particular phases of business activity.

Subjects to Be Covered

Virtually all of the more important problems with which Congress is expected to deal during the coming session will come up for discussion. Among these are: Flood control on the Mississippi River; Agricultural relief—the discussion will center on the report of the Business Men's Agricultural Commission; amendment of the Federal Reserve Act, the basis for which will be laid at special conference later in the year; the relation of the Government to public utilities and federal water power policy; trade relations; commercial forestry; federal taxation, including tax reduction and revision of the administrative provisions of the federal tax system; merchant marine; postal rates; state and local legislation; and stimulating voting at elections.

In addition to these subjects questions falling within restricted fields, such as aeronautics, foreign commerce, domestic distribution, natural resources, transportation and communication and civil development will be considered by the various committees appointed for that purpose.

Tentative Plans for Management Week

The subject for Management Week, Oct. 24 to 29 this year, is "Management's Share in Maintaining Prosperity."

The following groups are taking an active part in Management Week: American Institute of Accountants, American Society of Mechanical Engineers, Society of Industrial Engineers, Life Office Management Association, National Association of Office Managers, Taylor Society, National Association of Purchasing Agents, National Association of Foremen, and the American Management Association.

The officers of the American Management Association express a desire that members of the association in various cities will co-operate to the fullest extent possible. For further information regarding Management Week, members should write to R. M. Hudson, secretary-treasurer, National Committee on Management Week, Department of Commerce, Washington, D. C.

On Oct. 26 and 27 the Management Division of the American Society of Mechanical Engineers will hold a meeting at Rochester. The program tentatively is as follows:

Subject: "Co-ordinating Wage Incentives and Production Control." Chairman: W. Roy McCanne, general manager, Stromberg-Carlson Co.

(1) Paper by Oscar Grothe, vice-president, White Sewing Machine Corporation, Cleveland, and vice-president-in-charge, production executives' division, American Management Association.

(2) Paper by S. C. Hoey, assistant superintendent, Westinghouse Electric and Manufacturing Co.

Subject: "Co-ordinating Quality Control and Production Control." Chairman: G. S. Radford, consulting engineer, New Canaan, Conn.

(1) Paper on "Control of Quality," by Walter W. Graper, Bausch & Lomb Optical Co.

(2) Paper by J. H. Marks, purchasing manager, Packard Motor Car Co.

Subject: "Economic Problems in Production." Chairman: Henry T. Noyes, president, Art in Buttons.

(1) Paper on "How to Determine Expenditures in Material Handling Equipment," by George Hagemann, assistant editor, *Manufacturing Industries.*

(2) Paper on "How to Determine the Economic Lot Sizes," by F. E. Raymond, Crosby Steam Gage and Valve Co.

Subject: "Plant Location." Chairman: Harry Stevens, president, Rochester Folding Box Co. Papers on "Factors to Be Considered in Plant Location," by Tyler S. Rogers, district manager, the Ballinger Co., Philadelphia, and others.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

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THE complete stabilization of business has never been achieved, and as change is the law of life we will probably continue to have ups and downs until the end of time.

But it must be admitted, nevertheless, that by either accident or design, the level of prosperous activity in America has been remarkably well sustained for the last 12 months or more, and that even now it is difficult to discern any significant recession.

All that even the most pessimistic can say of last week's developments is that they include a reduction of about 5 per cent in car loadings as compared with last year, and net railway earnings for August that were nearly 10 per cent under those for the same month in 1926.

Perhaps the continued though slight contraction in building activity, with the falling off in automobile production, and the hopeful slackness of the steel industry should also be mentioned as indications of a reactionary trend. But the high record of production and distribution attained in 1926 was so phenomenal that its maintenance was not to be expected. Getting back to normal is therefore a better description than depression for the process through which we are now passing, and if this differentiation be kept in mind, the upward progress of business in the United States need not be checked by any psychological misgivings. But the important thing to remember is that there is no commercial congestion anywhere in this country. Hand to mouth buying, and the promptness with which speedy transportation has made it possible to replenish exhausted stocks, have kept inventories at a minimum. The result is that in proportion to their business merchants are borrowing but little, and that they are under no pressure whatever to force sales.

But of finance, as distinguished from commerce, the same thing cannot be said. Lacking mercantile employment, our superabundance of credit has flowed into the Stock Market, where it is being used to buy or finance a mass of newly created securities on a basis that is in many cases an expression of hope rather than of experience. Hence brokers' loans are again at a new high record, and the banks have more money invested in stocks and bonds than ever before in their history. This is a situation that disturbs the conservatives who were trained before there were any Federal Reserve banks to enlarge the basis of credit and impound the supply of monetary gold so that its reserve efficiency is incalculably increased.

Therefore it may be archaic to assume that bank loans that are not self-liquidating should be kept down to what was formerly considered a safe proportion of deposits.

This was a canon of banking practice before the war when every institution had to stand on its own bottom if trouble came. But with the development of the Federal Reserve system, the financial isolation of the member banks has been ended and as no sound bank can now be forced into suspension, the prejudice against loans that must be liquidated by re-borrowing is not as great as it was.

But the effect of tradition still persists, and those who adhere to the old ideas are sufficiently numerous to make their influence felt when they point out what they consider to be the danger of the credit expansion by which the recent advance in the securities market has been made possible.

This being the case, the fluctuations on the commodity exchanges cannot be regarded as especially significant. Cotton has advanced and declined as small crop estimates have been alternately in favor or disfavor. No great change is likely until Oct. 8, when the next government estimate will be issued, as both spinners and dry goods merchants seem disposed to await its guidance before buying freely. Among cotton shippers and brokers the prevailing sentiment seems to be bullish on the theory that the government's last estimate of 12,692,000 bales will not be materially exceeded, from which it is to be inferred that an increase over the figure would be something of a shock. The grain markets are also responsive to crop news. Wheat, like cotton, must still undergo the test of a heavy crop movement as the Canadian harvest is late.

Among the commodities which we buy abroad, coffee is in the most interesting position. The statistics are bearish, but Brazil is flouting them by borrowing enough money in Europe to finance the holding of the crop. If she negotiates these loans successfully the market will be temporarily relieved of the weight of the huge crop and though economists say the law of supply and demand cannot be disturbed with impunity, Brazil once before found relief from a similar predicament in a short crop. Thus the prospects for the next crop will soon assume dominant importance.

If any generalization is possible it is that the moderate advance in commodity prices which has been under way since midsummer seems to have been halted for the present. Nothing in these markets, in industrial conditions, or in foreign affairs is likely soon to distract the attention of the business community from its concentration on the stock market.

WHAT'S DOING IN INDUSTRY

SIGNS of increased fall activity have begun to appear all over the country. Considerable impetus was given this movement by the Cleveland and Detroit shows, and sales are generally reported to be of "better tone" in all important centers.

IN DETROIT, particularly, orders and inquiries have been received in larger numbers in the last two weeks. The automobile business seems to have picked up there, although paradoxically Indianapolis still reports a drag in activities in this line due to uncertainties about the new Ford model. In New England the demand is chiefly for high-production machines. While large buyers are inactive in New York, a fair business is being placed by small shops. Scattered orders from various sources feature the Cincinnati market.

CANADA also reports improved sales and general business is on the up-grade. Sales and inquiries in the South are better than during the same period last year, and the outlook for future orders is good. In Chicago, after a very dull season, there is hope of an immediate increase in activity in most markets.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

NEW ENGLAND

Production machinery has been in better demand in the New England territory during the past week, according to current opinion. There has been a representative amount of buying which, however, was well scattered. Small tools were also more active. Several small lot orders in various plants, arrived at a time when curtailment of operations might have been necessary.

Requirements for the automotive industry are now shaping up and orders have been placed. Proposals for contract work are being figured and indications are regarded as favorable for the placement of business in this territory. Production schedules in typewriter plants in Hartford are being increased.

The Pratt & Whitney Aircraft Co. will erect a hangar at Brainard Field, Hartford's airport. Expenditure of $75,000 is contemplated, and the hangar will be ample for accommodation of six to ten planes.

NEW YORK

The suspension of activity caused by the exodus of dealers, agents and buyers from this market to the machinery expositions in the Mid-West has not yet recovered sufficiently to warrant any opinion as to the probable effect of those expositions on future business. Dealers admit that many new and valuable leads were obtained and that inquiries have already begun to appear for some of the tools that were recently introduced.

It is the view generally expressed that large industrial users of machine shop equipment have been holding up orders. The present market has been sustained mostly by the small purchases of miscellaneous users—electrical shops, automotive repair and accessories makers, iron workers and steel fabricators. There has also been some scattered buying of used tools, including radial drills, shapers, planers and several lathes.

As a whole, September was rather disappointing in total volume of sales, but the impetus given by the expositions should be reflected in the next three months, bringing the year to a satisfactory close.

SOUTHERN DISTRICT

An improvement in the machine tool market is reported by Southern dealers in the last two weeks, with inquiry also picking up and giving promise of continued excellent demand during October. As a whole, sales are running better than at this time last year, and are expected to continue for the remainder of the year, with total volume the last half of 1927 the best it has been in the Southeast for this period in the past four or five years. Cotton and other important Southern crops are still selling at exceptionally high prices, resulting in an easier financial situation and improved industrial operations.

Perhaps the best moving line at this time is woodworking machinery, distributors in Atlanta reporting sales the past few weeks the best they have been at any period since the World War, with every promise that there will be little abatement in this business the next several weeks.

Garage equipment is showing improvement also, but most stations seem inclined to buy used or rebuilt rather than new equipment. Contractors' equipment also continues active in spite of the lateness of the building season. Some road-building work is still in progress but equipment sales are less active. A few sales of some size are reported to new textile mills, this business somewhat better than normal. Railroad equipment sales are about the same but the inquiry is less active. Smaller machine shops are buying little.

DETROIT

There has been a marked improvement in the machinery and machine tool market in the Detroit district within the past two weeks. A particularly good feeling has been noted within the last few days, largely as a result of the Cleveland show, it is believed.

A large number of inquiries have been received here and many orders have been placed. Some of these have been for special equipment but in the main they have been for milling and grinding machines.

Some orders have been received from the Ford Motor Co. and more are expected within the next week. This equipment is to be used for finishing small parts.

While no new announcements have been made by any of the General Motors plants, it is generally believed that many changes are contemplated. Chevrolet has made some fair sized purchases within the past two weeks; Oldsmobile is planning a large expansion, and Cadillac is expected to make some heavy purchases in the near future. It seems likely that a large increase in Cadillac production will follow soon.

Most of the dealers agree that the outlook is much improved and it is generally believed that there will be a large turnover between now and January.

CANADA

Sales of machine tools in Canada have been good during the last two weeks. Demand during the first half of September was moderate, but a quickening of activity in most lines of the metal working industry during the latter part of the month proved beneficial to machinery and machine tool dealers.

Steel production is now on the up-grade and the outlook for bridge building and similar large industries is considered bright. Sentiment among manufacturers generally is more cheerful than it was a month ago.

Output of steel during August was 77,479 tons, an increase of 40 per cent as compared with July. In the eight months ended Aug. 31, steel production totaled 620,039 tons, as compared with 541,705 tons in the same period last year.

Automobile production during August was 12,526 cars, an increase of 15 per cent over July. Production during the eight months ended Aug. 31, totalled 150,321 cars, as against 155,347 in the corresponding period of 1926.

INDIANAPOLIS

A better tone features the machinery and machine tool market here. Demand is more active, but it is from the volume of inquiries that the trade derives most of its encouragement. Inquiries are considerably more plentiful than during the past three or four months and indications are that some real buying will be done in the next few weeks.

A little more activity is reported in the automobile industry in this state. Production, it is said, would be greater were it not for the uncertainty in the market, due largely to the uncertainty of Mr. Ford's new model. The farm implement factories in this state are getting prepared, apparently, for a good production season, for they appear to be the most ready buyers for machine tools.

Demand for special machinery for public utilities is increasing. This is particularly true of gas and water utilities. Some enlargements also are being made and there is a considerable volume of replacements. With the increase in railroad business during the past month, more activity is seen from this source. Shop equipment to the various roads maintaining repair plants in the state, is selling more readily than heretofore this year.

A good demand continues to come from the coal industry, which in spite of labor difficulties, continues to increase production. Such items as power pumps, machine shop equipment and engine room equipment are wanted.

CINCINNATI

Machine tool manufacturers in the Cincinnati district report a slight increase in sales in the past week. Although but a short time has elapsed since the Cleveland exposition, it is stated that already there has been a favorable reaction. Selling agents report a slight increase in sales in the past week and express the feeling that a better market is developing, partly due to the fact that general business conditions are improving in this territory.

The backbone of the week's market was scattered orders for single tools and replacements, from general machinists and miscellaneous users, but there were also a number of orders that called for several tools. Railroads made a few scattering purchases of single tools and concerns in the automotive industry did likewise. There were a few export orders, these coming from Europe and South America.

The majority of concerns report a slightly reduced number of inquiries, this being attributed to the fact that the Cleveland exposition had just closed and therefore many buyers who had been there had not been at their desks long enough to take action. Among the inquiries received was one from the New York Central, for 4 lathes. Other inquiries were confined to single tools.

CHICAGO

Conditions in the machine tool industry may be said to be at a low level so far as actual, present business is concerned. Last week, most of the executives and sales managers were attending the exposition in Cleveland. From some of these the information comes that a number of satisfactory sales were made direct, and the foundations laid for an encouraging business in the future. Thus far there has scarcely been time to feel the effect of the getting together of exhibitors and users of machinery, but there is a practically unanimous belief expressed that the reaction will come up to expectations. The results should, and doubtless will, take concrete form in the very near future, dealers declare.

Increased Imports of Iron and Steel Hamper British Industries

Machine tool makers busy on contract work

By Our London Correspondent

THE outstanding feature of the last month in the British market is the rebate scheme to be put into operation by the steel makers. Firms that undertake to confine their purchases to steel of British manufacture are to be given a rebate of 7s. 6d. a ton on joists, and 5s. a ton on other defined materials, including plates ⅜ in. thick and upwards, and steel sections.

There has been much comment on the position of the iron and steel trades, the production capacity of which was increased by the war. When figures are examined it will be found that exports, if they have not grown, have at least kept up fairly well. Production too has increased and the home consumption has been high. The trouble appears to be that imports have grown markedly. Thus, disregarding last year, with the disastrous general and coal strikes, for the first eight months of 1925 the exports of iron and steel were valued at more than 45 million pounds and for the same period of this year at a little more than 45½ millions. On the other hand, corresponding imports during the first eight months of 1925 were valued at 16⅛ millions, whereas during the same period this year they amounted to about 24½ millions, an increase of about 50 per cent. Steel is being imported solely on account of difference in price and the various reasons given for this include higher wages and rates and taxes in Great Britain, these including the increase in the cost of social services provided, subsidies in other countries and high railway rates here.

No Advantage in Export

How far the rebate scheme is likely to be taken up it is not at present possible to say. While it may be accepted by the manufacturers who confine themselves to the home market, it is difficult to see how it can be of advantage to firms engaged in the export trade. For the rebate offered is insufficient to meet the difference between home and export prices, and a manufacturer who has to meet open competition abroad will be handicapped.

Exports of machinery so far this year, while definitely in advance of 1926, have hardly caught up with the values of 1925, the relative figures for exports in this class being about 31½ million pounds this year as against 32½ millions for the first eight months of 1925. In electrical goods and apparatus there has been a little increase, the total so far being 7⅛ million pounds. Vehicles at nearly 22½ millions are also slightly in advance of 1925, although not quite up to 1926 values. The exports in this class are of a wide order, including aircraft as well as automobiles, ships and locomotives, and pedal and other cycles. Imports of machinery this year have definitely increased, and approach 10⅜ million pounds, as against 8⅛ millions in 1925. Electrical goods imported at less than 2½ millions, show a small decline and imports in the vehicle class show a downward tendency, being more than 9¼ million pounds as compared with about 11⅜ millions.

Too Many Small Runs

Sheffield firms in particular have complained for a long time that many orders received are unprofitable owing to their small size. What is wanted is a long run. But the conditions are variable and some firms make no complaints; they are in the minority, however. Makers of small tools, including twist drill firms, report quieter times, and although orders for stainless steel and stainless steel goods keep to a fair level, the present conditions suggest too many firms in that line.

Generally, if trade is slack, the receipt is reported of quite a number of inquiries. This applies to the machine tool industry. In this line few firms outside three or four in the Midlands area can claim to be well employed. Conditions have not changed greatly and, as for many months, the electrical and automobile industries furnish the best demand. The usual seasonal slackening in the latter has been evident, but several firms are preparing for a record output next year. On some of the cheaper cars further reductions in prices have been announced. Some firms who claim to have new models in hand are purposely withholding information until the London show. This applies to General Motors which, in the re-organized and equipped works of Vauxhall Motors, of Luton, is producing 50 cars a week of a new type, the output to be quickly raised to 200 a week.

Electrical engineering is still well engaged, particularly in the home market. Some firms, that have catered specially to export have found competition very keen, with the result that profits have been greatly reduced. Shipbuilding has shown improvement, though it has not reached the dimensions that newspaper reports suggested.

The motor industry, of course, aids many anxiliary industries. Thus makers of special steels find in it a good customer, while forging and stamping plants are kept busy and one or two have recently been enlarged. It is still the principal customer for the machine tool manufacturer and has helped him out in more ways than one. A number of machine tool firms act as sub-contractors to the motor industry. They are among the few firms in this line that can claim to be something like fully engaged. For instance, recently calling on a firm that, before the war confined itself strictly to small machine tools, the writer found the works engaged right up to the limit of the power at present available. Machine tools form part of the output, but probably the larger section of the works is given over to the manufacture of special protographic apparatus, lawn mowers, and the machining of parts for a firm of commercial vehicle makers.

A brief reference may be made to a new method of super-hardening, and also hardness testing, devised by E. G. Herbert, of E. G. Herbert, Ltd., Levenshulme, Manchester. The process is to be exploited commercially but the necessary machines are not yet completed. The steel or other material is subjected to the bombardment of steel balls. In one experimental apparatus these fall from a height, a conveyor insuring continuous circulation, while in another method the balls fall down an incline and are struck upwards, at the velocity required, by rotating vanes, falling again to insure circulation. The process arose from an investigation of the extra hardness induced by abrasion, such as occurs in ordinary wear on hardened gears and cams for automobiles.

An exhibition of engineering interest has just been held at Olympia, London, W., but as it dealt with shipping as well as engineering and machinery, the contents covered a rather wider range than ordinary engineering. One or two English machine tools were shown and about the same number of American and Swiss. On the other hand, German machine tools were much in evidence.

J. R. Porter Heads Dealers Trade Association

The annual fall meeting of the Associated Machine Tool Dealers was held in Cleveland during the week of the National Machine Tool Exposition. Because of the presence in that city of many dealers from all over the country, the attendance at this meeting was the largest in the history of the association. There was no regular program of business, except the election of officers. J. R. Porter, of the Marshall & Huschart Machinery Co., Chicago, was elected president. T. W. Carlisle, of Strong, Carlisle & Hammond, Cleveland, was elected vice-president; and E. P. Essley, of the E. L. Essley Machinery Co., Chicago, was elected secretary. The new treasurer is George H. Cheerington, of the Brown & Zortman Machinery Co., Pittsburgh.

The executive committee includes the above officers and also the following members: G. E. Merryweather, of the Motch & Merryweather Machinery Co.; R. W. Phelps, of Henry Prentiss & Co.; W. J. Radcliffe, of the E. A. Kinsey Co.; J. W. Wright, of the Colcord & Wright Machinery and Supply Co. E. P. Ridings, of the Syracuse Supply Co., Syracuse, N. Y., was added to the executive committee this year.

Personals

GEORGE L. DRAKE has been appointed agency sales supervisor for the Lo-Hed hoist division of the American Engineering Co., of Philadelphia.

THOMAS CARLSON, formerly chief engineer for the Erie City Iron Works, has joined the engineering staff of the Casey-Hedges Co., of Chattanooga, Tenn.

JOHN J. HILT has been appointed sales manager for the Young Radiator Co., of Racine, Wis. Mr. Hilt was formerly associated with the Racine Radiator Co., and with the Perfex Radiator Co.

STEWART M. BUNTING, for twenty-five years associated with Niles-Bement-Pond, has established an office at 111 Broadway, New York City, and will act as manufacturer's agent for machinery and tools.

J. C. FITZPATRICK has been appointed district manager of sales in Cleveland, for the Chicago Pneumatic Tool Co., of New York. He succeeds J. L. Westenhaver, who has resigned.

WARD B. PERLEY, vice-president and general manager of the Canadian Steel Corporation, Ltd., Ojibway, Ontario, has been appointed president of the company to succeed the late Judge Elbert H. Gary.

FREDERICK E. MOSKOVICS, president of the Stutz Motor Car Co., Indianapolis, sailed for Europe on Sept. 28. While abroad he will attend the London and Paris automobile salons and will make a study of new principles of European automobile construction.

E. J. SKINNER was unanimously elected chairman of the board of directors of the Skinner Chuck Co., at a meeting of the board last week. Mr. Skinner has just completed 40 years of continuous service with the company, which was organized by his father in 1887.

Frederick G. Hughes, vice-president and director of the New Departure Manufacturing Co., of Bristol, Conn., who has been nominated for the presidency of the American Society for Steel Treating

Business Items

Automatic and Electric Furnaces, Ltd., of Holway, London, England, will move its works and offices to larger premises at the Elecfurn Works in Holway.

The D. H. Braymer Equipment Co., of Omaha, Neb., has been appointed representative in Nebraska and western Iowa for the Roller-Smith Co., of New York, manufacturers of electrical equipment.

The Eclipse Interchangeable Counterbore Co., of Detroit, announces the beginning of the construction of an addition to its plant which will give 100 per cent increase in manufacturing capacity when completed.

The control of the Quickwork Co., of St. Marys, Ohio, manufacturer of sheet metal working machinery, has been purchased by H. Collier Smith, and will be conducted under his name as successor to the Quickwork Co.

Yale Kaplan, of Bridgeport, Conn., has acquired the plant of the Colonial Brass Co., at Plainville, Conn. The plant will be utilized for the manufacture of tire removers and automobile accessories. The purchase includes a two-story brick factory and 6½ acres of land.

The Moltrup Steel Products Co., of Beaver Falls, Pa., announces the discontinuance of its connection with the H. D. Cushman Co., in Cleveland, and the establishment of its own branch sales office in that city in charge of S. D. Wallace. This new office is located at 409 Union Bldg.

The Air Reduction Co., Inc., of New York, has purchased the oxygen plant, equipment and entire business of the New England Compressed Gas Co., of Boston, Mass. The new addition will form an important link in the chain of oxygen plants controlled by this company all over the country.

The Thompson-Owens Corporation, Toledo, Ohio, has recently been incorporated for the manufacture of finished bronze bushings and bearings, brass and bronze castings. A modern plant, including foundry, located on the Toledo Terminal Railroad, has been acquired. The personnel of the new company includes: George Thompson, president and general manager; J. E. Owens, secretary-treasurer and sales manager. Both these men were formerly connected with the Bunting Brass and Bronze Co. The plant is being equipped with machinery and is expected to be in production by the middle of October.

B. & O. Pageant Shows 100 Years of Railroad Development

Both to celebrate its hundredth birthday and also to impress upon as many people as possible the great changes that have taken place in transportation in a single century, the Baltimore & Ohio R.R. staged a remarkable exposition at Halethorp, on the outskirts of Baltimore, last week. The exposition was known as the "Fair of the Iron Horse" and everything was done to make the exhibit attractive and convenient to visitors. No phase of transportation seemed to have been overlooked. Road beds, signalling, car and locomotive construction, with all their various details, were shown by illustration, by models and by the things themselves, many of them in actual operation.

In addition to the exhibits in the various buildings erected for the purpoise, a pageant was held each afternoon. No admission was charged, the whole object of the display being to impress the public with the great importance of the railway in American development.

The pageant began with representatives of the Blood and Piegan tribe of the Blackfeet Indians who came from Glacier Park with pack horses to illustrate the first form of land transport in America. The famous Conestoga wagon and the historic coach "Kearsarge," loaned by Henry Ford, was also part of the pageant. Following these came the development of locomotives and cars on a track approximating a circle 6,000 ft. in diameter. There was a replica of the old "Tom Thumb" built in 1829, and the "York" of 1831. The "Atlantic," however, built in 1832, was the original locomotive as was the "Thomas Jefferson" of 1835, and the "Memnon" of 1848. Following this was the "William Mason," 1856, the original of what was for many years the standard American passenger locomotive.

There were also many other old locomotives including the "DeWitt Clinton" and the "John Bull," all under their own steam. Among the modern locomotives were the "King George V," the largest passenger locomotive built in England, two huge locomotives from the Canadian Railway, the Delaware & Hudson locomotive carrying 450 lb. of steam, and many others.

Forthcoming Meetings

The administrative board of the American Engineering Council has been called to meet at York, Pa., on Oct. 20. Sessions will last two days. The president of the council, Dean Dexter S. Kimball of Cornell University, will preside.

American Gear Manufacturers Association. Fall meeting, Mount Royal Hotel, Montreal, Canada, Oct. 20, 21 and 22. T. W. Owen, secretary, 2443 Prospect St., Cleveland, Ohio.

American Aeronautical Exposition. First event, under the auspices of a committee of which Major General John F. O'Ryan is chairman; to be held at the 258th F. A. Armory, New York City, Oct. 20 to Nov. 6. Headquarters of the committee, 17 East 45th St., New York City.

American Institute of Steel Construction. Annual convention at Pinehurst, North Carolina, Oct. 25 to 29. Charles F. Abbott, executive director, 285 Madison Ave., New York City.

National Association of Manufacturers. Annual convention, Read House, Chattanooga, Tenn., Oct. 25, 26 and 27. George S. Boudinot, secretary, 50 Church St., New York City.

American Society of Mechanical Engineers. National management meeting, Rochester, N. Y., Oct. 26-27. Charles W. Lytle, chairman, Management Div., 29 W. 39th St., New York City.

National Founders Association. Convention, Hotel Astor, New York, N. Y., Nov. 16-17. J. M. Taylor, secretary, 22 S. La Salle St., Chicago.

American Society of Mechanical Engineers. Annual meeting, Engineering Societies Bldg., New York City, Dec. 5 to 8. C. E. Davies, assistant secretary in charge of meetings, 29 West 39th St., New York City.

National Exposition of Power and Mechanical Engineering. Sixth annual event in the Grand Central Palace, New York, Dec. 5 to 10. Charles F. Roth, manager, Grand Central Palace, New York City.

American Association for the Advancement of Science. Second Nashville meeting, Nashville, Tenn., Dec. 26-31, general headquarters Andrew Jackson Hotel. General chairman, W. S. Leathers, M.D., professor of preventative medicine and public health, Vanderbilt Medical School, Nashville, Tennessee.

The Weekly Price Guide

Rise and Fall of the Market

PRICES are weak, particularly in non-ferrous metals, steel pipe, and scrap of all descriptions. Pig-iron sales continue slow and in small lots. Slight improvement in demand is noted this week, in steel bars, strips, sheets, and tin plate. Quotations on the principal hot-rolled steel products hold firmly to a minimum of $1.75 per 100 lb., base, Pittsburgh, on bars, shapes, and plates. A price of $1.85 per 100 lb., however, applies on orders of a single carlot or under, f.o.b., mill. Steel ingot production continues at a rate, about 25 per cent below operations at this time last year.

(All prices as of Sept. 30)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$21.44
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.62
BIRMINGHAM	
No. 2 Foundry	17.75
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	21.26
CHICAGO	
No. 2 Foundry local	21.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	22.80
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	5.00@5.25
Cincinnati	5.00@5.50
New York	5.25@5.50
Chicago	4.75@5.25

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.25	3.50	3.25	3.89
No. 12	2.30	3.55	3.30	3.94
No. 14	2.35	3.60	3.35	3.99
No. 16	2.45	3.70	3.45	4.09
Black				
Nos. 18 to 20	3.05	3.75	3.55	4.00
No. 22	3.20	3.90	3.70	4.15
No. 24	3.25	3.95	3.75	4.20
No. 26	3.35	4.05	3.85	4.30
No. 28	3.50	4.20	4.00	4.45
Galvanized				
No. 10	3.15	4.10	3.95	4.25
Nos. 12 to 14	3.25	4.20	4.05	4.35
No. 16	3.35	4.30	4.15	4.45
No. 18	3.50	4.45	4.30	4.60
No. 20	3.65	4.60	4.45	4.75
No. 22	3.70	4.65	4.50	4.80
No. 24	3.85	4.80	4.65	4.95
No. 26	4.05	5.05	4.90	5.20
No. 28	4.30	5.30	5.15	5.45

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at warehouse in lots of less than 100 ft. or 100 lb.:

— Thickness — Decimal	B.w.g. and Fractions	Outside Diameter in Inches ¼	⅜	½	⅝	1	1¼	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	....	4.65
Spring steel, heavier	4.00	....	4.00
Coppered Bessemer rods (base)	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	6.35	6.25
Floor plates	5.25	5.30	5.00
Cold drawn, round and hex.†	4.00	3.65	3.60
Cold drawn, flats and squares	4.50	4.15	4.10
Structural shapes (base)	3.34	3.00	3.10
Soft steel bars (base)	3.24	3.00	3.00
Soft steel bar shapes (base)	3.24	3.00	3.00
Soft steel bands (base)	3.99	3.65	3.65
Tank plates (base)	3.34	3.20	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ¼, 7.85c.; 5/32 to ½, 7.35c. per lb. *Flat, 1/16@½-in. thick. †Shafting and screw stock.

METALS

Current Warehouse Prices in Cents Per Pound for Small Lots

Copper, electrolytic, up to carlots, New York			14.37½
Tin, pigs, 5-ton lots, New York			60.50
Lead, pigs, up to carlots, E. St. Louis	6.00	New York	6.87½
Zinc, slabs, up to carlots, E. St. Louis	6.15	New York	7.00

	New York	Cleveland	Chicago
Antimony, slabs, ton spot	13.50	16.50	13.00
Copper sheets, base	22.00	22.00	22.00
Copper wire, base	18.75	18.75	15.25*
Copper bars, base	21.50	21.50	21.50
Copper tubing, base	24.00	24.62½	24.00
Brass sheets, high, base	18.25	18.25	18.25
Brass tubing, high, base	23.12½	23.12½	23.12½
Brass rods, high, base	16.00	16.00	16.00
Brass wire, high, base	18.75	18.75	18.75

*Mill

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	26.00	26@27	26 02
Zinc sheets (casks)	11.00	11.55	10 11
Solder (½ and ¼), (case lots)	38.50	40 50	38½@42½
Babbitt metal, delivered, New York, cents per lb.:			
Genuine, highest grade			82 00
Commercial genuine, intermediate grade			61 00
Anti-friction metal, general service			31 50
No. 4 babbitt (f.o.b.)			12 50
Nickel, f.o.b. refinery, cents per lb.:			
Ingots 35 00	Electrolytic 39.00	Shot	36 00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	45.00
Cold drawn rods, Grade "A" (base)	53.00

Base price of Monel meral in cents per lb., f.o.b. Huntington, W. Va.:

Shot	28 00	Hot rolled rods (base)	35.00
Blocks	32.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50 00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible copper	11 25 @11.50	10.75	10 00@10 50
Copper, heavy, and wire	10 75 @11.25	10 75	9.75@10 25
Copper, light, and bottoms	9 50 @10 00	9.25	8.75@ 9.25
Heavy lead	5 00 @ 5 25	5.25	4 50@ 5.00
Tea lead	4.00 @ 4.25	3.75	3 50@ 4.00
Brass, heavy, yellow	7 00 @ 7.25	7.00	6.75@ 7 25
Brass, heavy, red	8.75 @ 9 25	9.50	8.75@ 9 25
Brass, light	5 25 @ 5.50	5.50	5.75@ 6 25
No. 1 yellow rod turnings	7.25 @ 7 50	7.00	6 75@ 7.25
Zinc	3.75 @ 4.00	3.25	3 00@ 3.50

TIN PLATES—Charcoal—Bright—Per box

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9 50
Coke Plates—Primes—Per box				
100-lb.,	14x20	6.45	6.10	7.00
Terne Plates—Small lots, 8-lb. Coating—Per box				
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0. 10@0. 13½	$0.16	$0.15@0.20
Cotton waste, colored, per lb.	.09@ .13	.12	.12@.17
Wiping cloths, washed white, per lb	15½	36 00 per M	.15
Sal soda, per lb	03½	02	02¾
Roll sulphur, per lb	02⁷	03½	04
Linseed oil, raw, per 7½-lb. gal., 5 bbl. lots	86½	.94	81
Lard cutting oil, 25% lard, in 5 gal. cans, per gal.	65	.50	.50
Machine oil, medium-bodied (55 gal. metal bbl.), per gal.	27	.35	.29
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft per inch of width for single ply.			
Medium grade	40–5%	40–5%	30–10–5%
Heavy grade	30–10%	30–10%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%
Second grade	50–10%	60–5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.04	.04	.04
Brass rods	per lb.	.16	.16	.1712½
Solder (½ and ¼)	per lb.	385	.40	.435
Cotton waste, white	per lb.	.10@13½	10@.13½	13@.17½
Emery disks, cloth, No. 1, 6 in. dia.	per 100	3 10	3.10	3.10
Lard cutting oil	per gal.	.65	.65	.55
Machine oil	per gal.	27	.27	.35
Belting, leather, medium	off list	40–5%	40–5%	40–5%
Machine bolts, up to 1x30 in., full kegs	off list	50%*	50%*	40%

*New list April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
*Flint paper	$5 13	$4.95	$5.13
*Emery paper	10.71	9 15	10.71
*Emery cloth	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1, per 100:			
Paper	1 29	1.27	1.32
Cloth	3 10	3.05	3.05
Fire clay, per 100 lb. bag		.75	.75
Coke, prompt furnace, per net ton		Connellsville,	3.25@3.75
Coke, prompt foundry, per net ton		Connellsville,	4.25@4 75
White lead, dry or in oil,	100 lb. kegs		New York, 13.75
Red lead, dry	100 lb. kegs		New York, 13.75
Red lead, in oil	100 lb. kegs		New York, 15.25

*4½ reams and under.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Broken Kegs or Cases	Full Kegs or Cases
Machine bolts, square heads and nuts:		
Up to ¾ x 6-in.	50%	50–10%
Larger up to 1 x 30-in.	45%	50%
1¼ and 1½ in. dia.	30%	35%
Carriage bolts:		
Up to ½ x 6-in.	50–10%	.....
Larger sizes	50%	.....
Coach and lag screws:		
Up to ½ x 6-in.	50–10%	.....
Larger sizes	50%	.....
Tap bolts, hexagonal heads	45%	.....
Nuts:		
Hot pressed, square and hexagonal, blank or tapped	45%	50–10%
Cold punched, square and hexagonal, blank or tapped	45%	50–10%
Semi-finished, hexagonal, tapped, in packages	40%	.....
Case hardened, hexagonal, tapped, in packages	30%	.....
Washers: Deduct from list, per 100 lb.	$1.50	$3.50
Rivets, button and cone head:		
Small, including 7/16-in. dia.	.....	50–10%
Large (base) per 100 lb.	$6.50	$5.00

EXTRA per 100 lb. on rivets: For ¼-in. dia., 35c.; ⅜-in., 15c.; 1-in., 5c.; length 1-in. and shorter, 25c.; longer than 1-in. up to and including 1 ½-in., 15c.; longer than 5-in., 25c.; standard countersunk head, 25c.

Machine Requirements and Industrial Construction

Equipment Wanted

Ind., New Albany—Bd. of Trustees, of School City—will receive bids until Oct. 13, for manual training woodworking machinery, also metal working machinery for general shop.

Mass., Cambridge (Boston P. O.)—P. O. Box, Cambridge C.—squaring shears, about 7 ft. long for cutting sheet iron up to 20 gage.

Mass., Cambridge (Boston P. O.) — Klauer Bros., 345 Franklin St.—miscellaneous tools and equipment for proposed repair and service garage. Estimated cost $40,000.

Mass., Watertown (Boston P. O.) — Lewis-Shepard Co., 124 Walnut St. (machinery)—equipment for proposed addition to factory.

Mich., Detroit — Detroit Dept. of Street Railways, St. Jean and Shoemaker Ave.—will receive bids until Oct. 10, for one general utility grinder and one pneumatic compression yoke riveter.

Mich., Detroit—National Pattern & Mfg. Co., 423 Mount Elliott Ave.—utility grinder.

O., Middletown—American Rolling Mills Co. Curtis Ave.—one ladle crane, one soaking pit crane and five small cranes.

Pa., Glenfield—Pryor Mfg. Co.—15 to 18 in. metal shaper.

Ont., Toronto—T. Forbes, 86 Lesmount Ave.—crane with clam shell bucket.

Opportunities for Future Business

Ala., Birmingham—The Gulf States Steel Co., Brown-Marx Bldg., will award contracts soon for extensions and improvements to various Alabama plants. Estimated total cost $4,000,000. Noted June 23.

Calif., Los Angeles—Adams Pipe Works, 2025 Bay St., is receiving bids for a 2 story, 50 x 175 ft. factory.

Calif., San Francisco—Crane Co., Second and Brannan Sts., is receiving bids for a 1 story annex to pipe shop. Estimated cost $40,000. L. P. Hobart, Crocker Bldg., Archt. T. Ronneberg, Crocker Bldg., Engr. Noted Aug. 25.

Calif., San Francisco—Voorman Co., 470 Natoma St., is receiving bids for a 1 story truck plant at 5th and Folsom Sts. Estimated cost $40,000. R. S. Chew, Rialto Bldg., Archt. General Motor Truck Co., 515 Van Ness Ave., lessee.

Calif., Westminster — Zenith Aircraft Corp., Santa Ana, plans the construction of a 1 story, 60 x 115 ft. airplane factory.

Conn., Hartford — White Co., B. M. Holden, 750 Main St., awarded contract for a 1 story, 150 x 150 ft. service station on Maple Ave. Estimated cost $100,000. Noted Aug. 4.

Ill., Chicago—C. Lange & Bros., 2625 Milwaukee Ave., is receiving bids for a 6 story repair and service garage at Logan Blvd. and Western Ave. Estimated cost including equipment $175,000.

Ill., Chicago — Russakov Can Co., 936 West Chicago Ave., manufacturer of sheet metal products, will soon receive bids for a 1 story plant. Estimated cost $50,000. B. Shapiro, 6 North Michigan Blvd., Consult. Engr. Noted Aug. 25.

Ill., Chicago — Wisconsin Steel Works, 2701 East 106th St., awarded contract for three additions to plant at 2701 East 106th St., 2615 East 110th St. and 2744 East 110th Pl. Estimated cost $70,000, $40,000 and $200,000 respectively.

Ill., DeKalb—American Steel & Wire Co., 208 South La Salle St., Chicago, awarded contract for a 1 story factory to replace fire loss, here. Estimated cost $180,000.

Ill., Rockford—Bennett Organ Co., R. J. Bennett, Pres., Rock Island, plans the construction of a factory. Estimated cost $250,000. Peterson & Johnson, Swedish American Bldg., Archts.

Ill., Rockford — Rockford Public Service Corp., T. M. Ellis, Pres., North Second and West State Sts., plans the construction of a garage. Architect not selected.

Ind., Indianapolis—A. Scherrer, Indiana Trust Bldg., Archt., plans a 3 story repair and service garage. Estimated including equipment $100,000. Owners' name withheld.

Ia., Dubuque — International Harvester Co., 606 South Michigan Ave., Chicago, Ill., awarded contract for a 95 x 538 ft. factory here. Estimated cost including equipment $150,000.

Mass., Brighton (Boston P. O.) — McBride-Cunningham Co., 12 Harcourt St., is receiving bids for a 1 story, 50 x 100 ft. auto shop. J. A. Quirk, 10 Tremont St., Boston, Archt.

Mass., Malden (Boston P. O.)—Palmer-Mullen Co., 60 Franklin St., manufacturers of plumbers' supplies, plans the construction of a workshop. Estimated cost $40,000. Noted Sept. 1.

Mass., New Bedford — Hathaway Machinery Co., 25 Elm St., awarded contract for a 1 story addition to machine shop.

Mass., Roxbury (Boston P. O.) — S. Rudnick, 68 Devonshire St., Boston, awarded contract for a 1 story, 185 x 280 ft. garage and repair shop at 1322 Tremont St., here. Estimated cost $75,000 to $100,000.

Mass., Springfield — Bay State Tool & Machine Co., 32 Cypress St., awarded contract for the construction of a machine shop at Westland Ave. and Albany St.

Mass., South Boston (Boston P. O.)—R. S. Brine Transportation Co., 43 India St., Boston, awarded contract for a 1 story, 70 x 120 ft. garage and repair shop at 194 West First St., here. Noted June 16.

Mich., Battle Creek—M. J. Morehouse, 343 Dearborn St., Chicago, Ill., Archt., is receiving bids for a 2 story, 80 x 150 ft. addition to factory on Washington Ave., here, for Sanitarium Hospital Equipment Co. Estimated cost $125,000.

Mich., Holland—Holland Furniture Co., is having plans prepared for a new unit to plant. Estimated cost $60,000.

Mo., Independence — Gleaner Combine Harvester Co., manufacturers of harvesting and other agricultural equipment, is receiving bids 1 story addition to factory. Estimated cost $80,000.

N. J., East Orange—Baldwin Construction Co., 614 Central Ave., will soon award contract for a 2 story, 120 x 200 ft. garage at Halstead St. and R.R. Plaza. Estimated cost $150,000. E. V. & C. F. Warren, Essex Bldg., Newark, Archts. Noted Sept. 29.

N. J., Jersey City—A. Davis, 140 Montgomery St., Archt., is preparing plans for a 2 story, 200 x 290 ft. repair and service garage. Estimated cost $150,000. Owner's name withheld.

N. J., Newark—Art Metal Works, L. V. Aronson, Pres., Mulberry and Center Sts., has acquired adjoining property and plans an addition to plant. Estimated cost including equipment $50,000.

N. J., Paterson—J. A. McCrane Motors Co., 638 Market St., awarded contract for a 1 story, 100 x 300 ft. garage at Market and East 36th Sts. Estimated cost $150,000. Noted Aug. 4.

N. Y., New York — Vedava Realty Co., 532 5th Ave., awarded contract for a 3 story, 104 x 200 ft. garage at 623 57th St. Estimated cost $200,000. Yellow Taxi Co., lessee.

N. Y., Syracuse—The White Motor Co., manufacturers of motor trucks, 15th St. and St. Clair Ave., Cleveland, O., awarded contract for a 1 and 2 story factory here. Estimated cost $150,000. Noted Feb. 17.

O., Cincinnati—Daylight Realty Co., 718 First National Bank Bldg., awarded contract for a 5 story service station at Sixth and Court Sts. Estimated cost $300,000. Noted Sept. 22.

O., Cincinnati — Oakley Chevrolet Co., Madison Rd., will soon award contract for a 2 story repair shop. Estimated cost $60,000. Taylor & Kenny, First National Bank Bldg., Portsmouth, Archts.

O., Cleveland — The Atlas Car & Mfg. Co., C. S. Harbaugh, Secy. and Treas., awarded contract for a 2 story, 60 x 120 ft. factory at 1100 Ivanhoe Rd. Estimated cost $40,000.

O., Cleveland — Champion Machine & Forging Co., L. W. Greve, Pres., 3695 East 78th St., is receiving bids for a 1 story, 89 x 178 ft. factory. Estimated cost $75,000. E. McGeorge, 3030 Euclid Ave., Archt. and Engr.

O., Cleveland—New York Central R.R., 466 Lexington Ave., New York, N. Y., had plans prepared for the construction of 1 story, 20 x 364 and 30 x 30 ft. additions to engine house and fan room on East 152nd St., here. Estimated cost $80,000. F. B. Freeman, Ch. Engr.

O., Dayton—Stomps Sales Co., 504 South Main St., awarded contract for a 3 story, 100 x 200 ft. auto sales and service station. Estimated cost $160,000.

O., Dover — Reeves Mfg. Co., manufacturers of sheet metal products, awarded contract for a 1 story factory. Estimated cost $40,000.

O., Galion—The Galion Iron Works & Mfg. Co., will soon award contract for a 1 story, 85 x 343 ft. factory. Althouse & Jones, Market Bldg., Mansfield, Archts.

Pa., Oil City — Re-Mac Garage Co., awarded contract for a 1 story, 80 x 180 ft. garage on Swiss St. Estimated cost $40,000.

Pa., Pittsburgh — Chaplin Fulton Mfg. Co., 36 Penn Ave., awarded contract for a 3 story, 60 x 100 ft. addition to brass foundry. Estimated cost $40,000.

Pa., Sharon—Sharon Steel Hoop Co., is having plans prepared for a 1 story, 300 x 300 ft. addition to plant. Estimated cost $150,000. Private plans.

Tenn., Chattanooga — Century Co. awarded contract for a 1 story, 90 x 130 ft. garage at Broad St. bewteen Twelfth and Thirteenth Sts. Noted Apr. 28.

Tex., Arlington — Southern Ornamental Iron Works Inc., Dallas, plans the construction of a 1 story plant here. Estimated cost including equipment $60,000.

Tex., Fort Worth — The North Texas Traction Co., Pacific and Pine Sts., awarded contract for the construction of a machine shop. Estimated cost $25,000.

Tex. San Antonio—Motoramp Garage, Inc., c/o A. O. McCracken, Jr., 215 North Alamo St., is having preliminary plans prepared for the construction of a garage. Estimated cost $150,000.

Tex., San Antonio—H. J. Shearer, 303 Mary Louise Dr., plans the construction of a 6 story, 160 x 167 ft. garage at East Houston St., between Bowie and Nacogdoches Sts. Estimated cost $450,000.

Wis., Two Rivers—The Aluminum Goods Mfg. Co., 1500 Franklin St., Manitowoc, had plans prepared for additions to plant here. Estimated cost $450,000.